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LAURIER INCORPORATED HA-225 PLUS SERVICE MANUAL

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November 29, 1993

Mr. Frank Judd
Room 21-204
AT&T
9999 Hamilton Blvd.
Breinigsville, PA 18031-9359

Dear Frank,

As a follow up to your conversation with Scott Evans, I have enclosed a manual on our HA-225 Plus for you. I have added the drawings that are applicable to your machine purchased. If any drawings are not included that you would like please do not hesitate to contact me. Also, I have enclosed our new HA-225 Plus brochure for your files.

Thank you.

Sincerely,

Tamme Dustin

Tamme J. Dustin
Mktg/Sales Administrator

/TD

Encl: (1)

cc: S. Evans/Laurier
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SECTION 1 - INTRODUCTION

Congratulations on the purchase of your new Laurier Model HA-225P Hybrid Die Bonder. We are certain by following the simple instructions and suggestions in your service manual,you will receive many years of reliable service from your new machine. Your service manual is designed to walk you through assembly, programming and general maintenance.

PLEASE READ THE COMPLETE MANUAL BEFORE ATTEMPTING TO OPERATE THE MACHINE.

SECTION 2 - INSTALLATION

2.1 UNPACKING

NOTE: AS WITH ALL ELECTRIC EQUIPMENT PLEASE USE CAUTION WHEN UNCRATING MACHINE AND UNPACKING VARIOUS COMPONENTS. THE TWO SCREWS LOCATED ON THE MAIN X AND Y AXES AND THE LINEAR OUTPUT TABLE MUST BE REMOVED BEFORE POWERING ON THE MACHINE.

After crate is disassembled, unpack all of the individual boxes and cartons. The following items should be included:

1 Additional Accessories *
1 Keyboard
1 Input Workholder
1 Cognex Vision System *
1 Rotary Input Station *
1 Spare Parts Kit *

* IF ORDERED

2.2 INSTALLATION

1. Unpack the keyboard and place it on the slide out table assembly located at the front of the machine. Connect the appropriate cable to the keyboard.

2. Remove the locks on the X and Y axes.

3. Place all the appropriate hardware on the machine. (Rotary input station, workholder, etc.)

2.3 SYSTEM REQUIREMENTS

1. Domestic voltage requirements - 120 V.A.C., 60HZ, 10 AMPS

2. Foreign voltage requirements - 220 V.A.C., 50HZ

3. Vacuum requirements 20in. Hg. minimum

4. Air Pressure 20 PSI

SECTION 3 - SYSTEM SET UP

3.1 INTRODUCTION

You are now ready to start up your HA-225 Die Bonder. The next section of the manual will guide you through the mechanical set up of the machine. For this operation, it will be necessary to power up the machine. Although certain menus will be displayed on the screen at this point, please follow the suggested key strokes. The other portions of all menus will be described further on in the manual. The following sequence should be followed:

3.2 CHECKLIST

1. Proper connections

2. Power requirements

3. Air and vacuum requirements

4. Removal of table locks

NOTE: To prevent damage to pickup collet, vacuum must be applied before machine power is on.

3.3 SYSTEM POWER UP

1.Turn on the main power switch located on the left hand side of the machine.

2.The PC will need a moment or two to perform some internal diagnostics, it will then proceed to boot up the HA-225 software. The X and Y axes of the head, and the linear output table will home. Then the Read Data Menu will appear:

READ DATA
PRESS ESC TO ABORT
ENTER FILENAME & PRESS <CR> TO LOAD
THE CURRENT FILENAME IS _?

C:\225\
HA .DAT FILENAME .DAT

21000000 Bytes Free

Enter the filename HA and press enter. It is not necessary to type in the file extension. The HA program is a basic program with the least amount of data. A file must be loaded into all allocated memory locations or the machine will halt when entering into the data menus.

The Main Menu will now appear.

1. AUTOMATIC OPERATION
2. VIEW DATA
3. READ DATA
4. SAVE DATA
5. TEACH MODE
6. MACHINE SETUP
7. FIXED REFERENCE POINTS
8. SYSTEM INITIALIZE
9. MANUAL OPERATION
A. EPOXY DEPOSIT
B. VISION SYSTEM
C. QUIT

3.4 INITIAL SET UP

The highlighted bar is positioned by pressing the arrowed keys located on the right hand side of the computer keyboard or by simply typing in the corresponding number.

3.5 FIXED REFERENCE POINT

Choose number 7 from the Main Menu. The X and Y axes will move to a reference point. The screen will display the fixed reference point program information.

The bottom of the screen displays a message which instructs the operator to **"FIND REFERENCE POINT"** and the **"TARGET"** selection is highlighted.

There is a **"QUIT"** option to return to the Main Menu.

To determine the reference point, the operator moves the pickup arm with the jog box (remote table top box with arrow keys).

The fixed reference point should be a point situated on the rotary index plate/linear table.

The exact point will be determined by the intersection of the crosshairs on the monitor screen. When the crosshair has been moved to this point, press carriage return to set the fixed reference point in the systems memory.

From this point, all other points are referenced.

3.6 COLLET VIEW OFFSET

We will now proceed to calibrate the space differential between the pickup tool and the image produced by the output camera.

The supplies necessary for this adjustment will be a piece of carbon paper (approximately one inch square) and a scrap substrate.

The following procedure should be followed:

A. From the Main Menu enter into Sub Menu number 9 **MANUAL OPERATION.**

B. From this menu enter into Sub Menu 3 **SET COLLET OFFSET.**

C. Secure the substrate on the output work station and loosely place the carbon paper on top.

D. Move the pickup tool above the substrate and make a mark on the substrate by manually moving the collet downward. (As instructed on the monitor.) Press carriage return.

E. Remove the carbon paper, **BEING CAREFUL NOT TO MOVE THE SUBSTRATE.**

F. Move the pickup head until the image of the carbon dot is located in the center of the TV monitor crosshair. (As instructed on the monitor.) Press carriage return.

This procedure must be done as accurately as possible to insure accuracy during die placement. Align the center of the carbon dot, which represents the center of the collet to the best of your ability.

G. Select sub menu number 11 **MAIN MENU** which will bring you back to the Main Menu.

H. Save the product file by selecting menu number 4 SAVE DATA. The Save Data menu will appear:

ENTER 'S' TO SAVE

ANY OTHER KEY TO ABANDON

CURRENT FILE NAME = HA

SAVE DATA. HA WILL BE OVERWRITTEN.

Press s then type in the filename or enter if the it is the same.

I. Read the data back into memory to keep everything current by selecting menu number 3 READ DATA. (See Sect 3.3)

3.7 MACHINE SETUP

Choose number 6 **MACHINE SET UP** from the main menu.

The following menu will be displayed.

1. JOB NAME :
2. # INDEXES : 3
3. # SUBSTRATES : 3
4. DOWN DELAY PLACE : 450
5. UP DELAY PLACE : 400
6. DOWN DELAY EPOXY : 100
7. UP DELAY EPOXY : 100
8. COMMENT :
9. PICK POINTS : -

A. HOME POINT : -
B. SET REFERENCE : -
C. SNAPSTRATE (Y/N) : Y

This menu must be completed in the order of its appearance. You may however, use the escape key to exit this mode.

JOB NAME - Is the name of the given substrate to be run. This will appear on the top line of the main menu. Up to eight characters may be entered.

 # INDEXES - Is the number of positions on the output station.

 # SUBSTRATES - Is the number of substrates which are going to be built. It is possible to build a lower number of substrates than what the index plate will hold. The system will still be able to run in the automatic mode, it will index only the number of substrates that was selected.

DOWN DELAY - Is amount of time until the pickup arm starts to go down.

UP DELAY - Is the amount of time the system waits for the arm to come up before it starts to move.

DOWN DELAY EPOXY - Enter a number (1-999). This variable is the amount of time the dispenser takes to before the deposit cycle begins. 50-200 is a good average.

UP DELAY EPOXY - Enter a number (1-999). This variable is the amount of time the system waits for the arm return up before moving to its next location. 50-100 is a good average.

COMMENT - Is used to denote useful information for future reference such as programmers name, date programmed etc.

PICK POINTS - Will allow the operator to determine the precise locations from which devices are to be picked up. The following procedure should be followed:

1) Place a light colored tray pack on the input workholder.

2) Place the carbon paper over the tray pack.

3) Position the pick up tool over the carbon paper.

4) Move the arm down manually to make a carbon impression of the collet on the tray pack.

5) Remove the carbon paper.

6) Position the workholder so that the carbon impression is situated in the intersection of the crosshairs. Set the zoom lens to highest magnification. Be sure that the crosshairs are centered on the dot. It may be necessary to move the pick up arm.

7) Being careful not to move the workholder, move the pick up arm so that the collet is again situated over the carbon dot.

8) Press carriage return.

The machine then instructs the operator to position collet over pick point #2. If there is a second pick location, usually a vibratory feeder or tape reel, line up the collet to this point and press return. If there are no additional pick points, simply press return.

NOTE: This procedure plays a very important role with the accuracy during die pick up. Please be very precise with each step to insure the utmost accuracy of the equipment.

HOME POINT - Determine the precise location of the pick up arm when an air blast is supplied to the pick up collet. is recommended that the home location not be situated over die trays or substrates.

SET REFERENCE - Is two points on the substrate used for registration.

The following procedure should be followed if you **are not** using snapstrates and your answer to the next step <.SNAPSTRATES (Y/N) is "N" for No.

The first would be located on the upper right hand side of the substrate as viewed on the monitor. The second would be on the left hand side of the substrate as viewed in the monitor.

When a carriage return is pressed after setting the reference points, a second questions comes up as to whether you want to set the reference point. This is answered with a "Y" or "N". If the operator answers "yes", these points will be set for all the substrates around the rotary\linear table. If the operator answers "no" then this point will only be set for the program substrate only.

The following procedure should be followed if you are using snapstrates and your answer to the next step <. Snapstrate (Y/N) is "Y" for yes.

The first reference point would be located on the upper right hand circuit of the snapstrate as viewed on the monitor. The second reference point would be located on the upper left hand circuit of the snapstrate. the same point used as reference point #1.

SNAPSTRATE - Will determine if a snapstrate is being programmed. An answer of "N" for "No" will move the cursor to the next variable. A "Y" for "YES" will initiate a series of questions.

The first will be Input Horizontal Circuit Count (1-16). The operator needs to input the number of circuits that are on the snapstrate horizontally, then press carriage return.

The next questions is Input Vertical Circuit Count (1-16). The operator inputs the numberof circuits on the snapstrate in the vertical position, then press carriage return.

When carriage return is pressed the machine will automatically sequence to reference point #1 (same reference point #1 as programmed in B. SET REFERENCE) as well as sequence to the bottom left hand circuit of the snapstrate.

This point should be the same reference point on the circuit as used for the upper right hand circuit, except this should be located on the bottom left hand circuit on the snapstrate. A message should now appear on the monitor that says "Press <CR> to confirm initial snap reference point (do not change). Press carriage return. A new message should now appear on the monitor screen prompting you to "Adjust cross hair at bottom right corner of snap area, Press <CR>". This point should be the same reference point on the circuit as was programmed in B. SET REFERENCE (top right hand circuit, top left hand circuit) except this point should be located on the lower right hand circuit of the snapstrate. Adjust cross hairs to this point and press carriage return.

You will be prompted on the monitor "To Edit Again type menu number, Else <CR>." If you need to edit any of your variable's you just programmed for machine set up do so now. If you are satisfied with these variables press carriage return. You will now be back to the main menu.

It is recommended that you save the product file each time a value is entered or changed then reload the data back into memory to ensure that all data is current. (See sect. 3.6 steps H.and I)

SECTION 3.8 MANUAL OPERATION

Before going on to Section 4 Programming Parts Placement its important that you know how to set, select, and check various variables of the HA-225 manual operations.

From the main menu press number 9 manual operations. The following menu will be displayed.

1. Send command string and display result
2. Run Init. Routine
3. Set collet offset
4. Set output table indexes
5. Set output table spacing
6. Set output table offset
7. Select output position
8. Read X Position
9. Read Y Position
10. Read Z Position
11 Main Menu

Previous Selection:
Enter Choice:

This menu does not have to be completed in any fixed order.

1. **Send Command String and Display Result** - This is explained in full detail in Section 6.4 Machine Notes Part # 3

2. **Run Init. Routine** - Basically initializes the system to its "home" position.

3. **Set Collet Offset** - Already explained this in Section 3.6 collet view offset.

4. **Set Output Table Indexes** - Is the number of positions or substrates on the output station.

5. **Set Output Table Spacing** - Is the amount of spacing you want between indexes or substrates. After each index you want to be centered on the substrate.

6. **Set Output Table Offset** - Is the first index point referenced from the home position. Again you would want this point to be in the center of your first substrate.

7. **Select Output Position** - When carriage return is pressed system indexes to the next position. This is a good way to check to see if you have correctly set your Output Table Spacing and Output table offset.

Once you are all sure you have correctly entered the correct values for output table indexes, output table spacing, and output table offset you must save these values to hard disk. Press "Esc" key to return to operate menu, press number "11" to return to main menu. Press number "4", Return to save data. Press "S" key, type in name of the current file you are in and/or you are working with. Press number "3" "Read Data", Return. Press return to load this onto hard disk and to return to Main Menu.

SECTION 4 - PROGRAMMING

4.1 PARTS PLACEMENT PROGRAMMING

Choose number 5 **TEACH MODE** from the main menu. A question will be displayed that asks the operator to Enter Beginning Sequential Device Number. This allows the operator to start at any sequence, to facilitate editing a specific bond site.

When programming a new job, the operator will start at location 1 so all that is necessary is a carriage return.

The teach menu will now appear, it looks like this:

1. PRINT NAME 1-6 CHARS : _____
2. PART TYPE 1-15 CHARS : _____
3. MAGNIFICATION 1-999 : 1
4. BOX SIZE/TRAINING - : -
5. COLLET NUMBER 1-3 : 1
6. ACCELERATION 1-3 : 1
7. SPEED 1-3 : 1
8. INPUT DWELL 1-255 : 50
9. OUTPUT DWELL 1-255 : 50
10. VIEW OUTPUT Y/N : N
11. VACUUM SENSE Y/N : N
12. SEATING PRESSURE Y/N : N
13. PICK POINT 1/2 : N
14. PLACE POINT - : -

This menu must be completed in order of appearance. Each set of variables represents only one die bond.

PRINT NAME - Is used to tell the operator the name of the part as it appears on the print (e.g. R1, C2, etc.).

This information will be displayed on the computer monitor during the production cycle.

Note: The placement of a % sign (e.g. %R1) before the variable above will indicate the last of a particular device to be bonded.

For example, if there is only one of a particular device type per circuit, it would be preceded with a % sign. If there were three of the same device on a given circuit, the % sign may only precede the third device in the sequence.

PART TYPE - The type of part to be placed should be inserted here. (e.g. Resistor, Capacitor, part number etc.).

MAGNIFICATION - Is a comment instructing the operator to set the input zoom lens to a particular magnification for the given device. To establish a proper zoom setting, place the device being programmed in the optical field of view. Twist the zoom barrell until the chip is clearly viewed.

Note: For zoom lens adjustment, see Section 6.3.

BOX SIZE - Is used to program the size of the envelope displayed on the monitor to correspond to the device being picked.

Note: The device designed to be used for a particular bond location should be placed under the input camera at this time.

The arrow keys on the keyboard may be used to change the size of the box.

The arrow keys on the right hand keypad can be used to move the crosshairs within the box for different die orientations and to promp the operator to faciltate this process.

Note: This item should be programmed to correspond to the zoom setting selected in the previous variable. Both magnification and box size may vary by device.

TRAINING: - (VISION SYSTEM OPTION ONLY)

The device being programmed will be trained as soon as the box size has been completed. A training box will appear to the right of the menu and you will be instructed to position the device in the box for training.

It is **most important** that the device to be trained is aligned orthogonally within the box since any rotational (Theta) error in the device at time of training will be captured as the "desired" orientation by the vision system.

Pressing the enter key will then start training. The upper left and right corners of the device will then be automatically Trained, Displayed and Stored as a model for the programming developed. A message will appear when training is complete and the highlight bar will move down to the nest item.

NOTE: In the event that training is **not** desired during editing of a program pressing the **escape** key twice will advance you to the next item without training.

COLLET NUMBER - Is a comment to prompt the operator as to which collet to use in the event that the system uses a multi collet turret.

ACCELERATION - Is the ramp speed of the transfer arms during a pick cycle.

A variable of 1, 2, or 3 may be selected with on (1) being the fastest and three (3) being the slowest.

SPEED - Is the final velocity of the transfer arms during a pick cycle. The fastest speed is (1) and the slowest is (3). The speed and acceleration can be set to lower levels for difficult to handle or extremely large devices.

INPUT DWELL - Is the amount of time the pickup arm stays down at the pick location.

The 1 to 255 TICKS variable represents microprocessor loops; number 1 represents the smaller value. The average setting is around (50). (TICK = 5 MS).

OUTPUT DWELL - Is the amount of time the pickup arm stays down at the place location. The average setting is around 50.

VIEW OUTPUT - If this option is selected with a "Y", the standard assembly process will be interrupted. The machine will view the bond site after the device is bonded, the camera will view the chip so that positional adjustments may be made. If "N" is selected, the assembly process is much quicker. Each footswitch will represent a picked device.

VACUUM SENSE - Is used to determine if a device is on the collet.

If a device is not sensed on the collet, the arm will be inhibited from moving downward at the place location (prevents collet from contacting the epoxy) and the output stage will not index to the next location.

A "Y" must be typed if the vacuum sense is desired and "N" if not.

SEATING PRESSURE - Is selected if there is a need to put pressure on the device to seat it in epoxy. The pressure may be determined by setting the regulator labeled "Z" on the side panel.

PICK POINT - Is used to determine which pick point to use for the device being programmed.

"1" is programmed for the pick point, if the device is going to be picked under the input camera.

"2" is programmed, if the device will be picked from a second source such as a vibratory feeder or tape reel.

PLACE POINT - Represents the bond pad where the device will be placed on the substrate.

When carriage return is pressed, the operator is told to Find Place Point.

Utilizing the jog box, the operator positions the transfer head so that the desired bond pad is being viewed on the left hand monitor. Use the crosshairs to target the given bond pad.

Press return and the place point is set. The operator is given the choice to edit if desired. Simply type in the desired line number to be edited and carriage return, the correct response may now be typed in.

When a carriage return is pressed after editing is complete, the operator is told that this particular sequence # is complete. If more parts are to be programmed, then press carriage return and the next sequence will begin.

If there are no more parts to be programmed, use the **QUIT** function at the bottom of the screen to exit this mode and return back to the main menu.

Note: There are two ways to use the functions at the bottom of the screen.

1) Type in the first letter of the name of the function and a carriage return.

Example: If the **QUIT** function is desired, type "Q" then a carriage return.

2) Use the arrowed keys on the keyboard to highlight the desired function, then press a carriage return.

Once you are sure you have completed parts programming with the correct values, from the Main Menu press # 4 "Save Data". Press "S" key then type in the filename or press return if it is the same filename. You now must read data back into memory to keep everything current by selecting from Main Menu # 3 "Read Data". Press return \enter twice and you will now be back in the Main Menu.

NOTE: IT IS EXTREMELY IMPORTANT ANYTIME YOU "SAVE DATA" FROM THE MAIN MENU THAT YOU ALSO "READ DATA" FROM THE MAIN MENU AS WELL.

4.2 PARTS PLACEMENT EDITING

The HA-225 is equipped with the three following edit functions:

1) EDIT BOND LOCATIONS

2) EDIT BONDING PARAMETERS

3) DELETING or RESEQUENCING

EDIT BOND LOCATIONS - Used for changing only the position of where the device is to be placed.

STEP 1. From the main menu enter into sub menu #1 **AUTOMATIC OPERATION.**

The menu shown here is the **OPERATE MENU.**

STEP 2. From the **OPERATE MENU**, enter into sub menu #3 **WALK THROUGH**. The system will position the transfer arms so that the output camera is now viewing the first bond location. The crosshair represents the bond sight.

STEP 3. Using the XY jog box, position the crosshair where desired, then press a carriage return. This procedure may be repeated for any number of bond locations.

You may use the **QUIT** Function at the bottom of the screen or the ESC key to exit out of this mode.

EDIT BOND PARAMETERS - Used for changing transfer speeds, window size, dwell times or anything necessary for a particular device.

These changes are made exactly as the original program was written.

Utilizing the same menu, the **TEACH MODE** (#5 from the Main Menu), any sequence can be edited immediately.

If it is desired to edit only one or two sequences, type in the appropriate sequence number after entering **TEACH MODE**.

You'll notice the statement **"ENTER BEGINNING SEQUENTIAL DEVICE NUMBER"** which will be displayed on the screen. At this time, enter in the program sequence to be edited.

DELETING OR RESEQUENCING PROGRAM STEPS - used to eliminate a bond site or resequence existing bond sites.

STEP 1. From the main menu, enter into sub menu #2 **VIEW DATA**. The X,Y coordinates as well as other program information will be displayed on the screen.

DELETE To delete, move the highlighted bar to the word **DELETE**. Press carriage return and enter the location to be removed. Press carriage return again and the device is eliminated.
NOTE: The device is still resident in a hidden memory. If the device is to be eliminated forever, use #4 from the Main Menu, **SAVE DATA.**

MOVE To change the order in which die will be placed, move the highlighted bar to the resequence function at the bottom of the screen.

Press carriage return and the system will ask for the desired function to be moved. Type in the correct response.

The system will now ask which sequence # you would like to place this one before. Type in the correct response and then press carriage return.

The system will automatically resequence the numbers.

After all editing is complete, press the **ESC** key to return to the main menu. Use #4 **SAVE DATA**. To Save Data Press "S" key. Press carriage return to return to main menu.

NOTE: Vision System option only. If sequences have been moved and sequence numbers altered, the devices must be retrained in their new order.

4.3 EPOXY DEPOSIT PROGRAMMING

You have now completed the parts programming phase of the machine. If the epoxy on your substrates is prescreened or predeposited, you may skip this section of the manual and proceed directly to **SECTION 5.5 PRODUCT SET UP.**

However, if you want to use the optional programmable material dispenser, the following procedure must be followed:

STEP 1. From the main menu, enter sub menu **"A" EPOXY DEPOSIT.** The following menu will be displayed:

1. AUTOMATIC OPERATION
2. VIEW DATA
3. READ DATA
4. SAVE DATA
5. TEACH MODE
6. MACHINE SETUP
7. FIXED REFERENCE POINTS
8. SYSTEM INITIALIZE
9. MANUAL OPERATION

A. PURGE
B. PARTS PLACEMENT
C. QUIT

NOTE: This menu is extremely similar to the main menu of the parts placement section. It will also be programmed in the same way.

As with the parts placement, epoxy deposition can be programmed only after the offset between the dispense tip and the image produced by the output camera has been determined.

The following procedure should be followed:

NOTE: BEFORE BEGINNING THIS PROCEDURE, IT WILL BE NECESSARY TO FILL THE EPOXY SYRINGE WITH MATERIAL AND PLACE A CLEAN DISPENSE TIP IN THE MECHANISM.

Step 1. From the main menu, enter into sub menu #9 **MANUAL OPERATION.**

Step 2. From here, enter into sub menu #1 **SEND STRING COMMAND.**

Step 3. Type SII (must be capital letters). Press carriage return. Epoxy should soon emerge from the dispense tip. When the epoxy has reached the tip, type S10.

NOTE: It may be necessary to make a pressure adjustment at the regulator labeled "Epoxy" located behind the top left panel of the machine.

To increase the air pressure, turn the knob clockwise. The exact pressure may be verified by pushing the button located above the "epoxy" regulator control and the test button simultaneously.

Remember: To turn on the air pressure to the epoxy, type "SII" and to turn it off, type "S10".

When complete, hit the **"ESC"** key.

Now that we have epoxy at the dispense tip, we can now proceed to make the alignment between the output camera and the dispense tip.

4.3.1 SET NOZZLE OFFSET

Step 1. From the main menu, enter into sub meno #9.

Step 2. From this menu, enter into sub menu #3 **SET NOZZLE OFFSET** and carriage return.

Step 3. Position the dispense tip over a scrap substrate and hit the carriage return. The dispense tip should have gone down and deposited epoxy on the substrate. If not, then manually move the dispense tip downward. You should have a dot of epoxy at this time.

Step 4. As the screen will instruct you, use the XY jog box to position the pickup head such that the epoxy dot is centered in the crosshair. Press carriage return.

Step 5. Enter #11 **MAIN MENU** to return to the main menu.

4.4 MACHINE SETUP (EPOXY)

From the main menu, enter into sub menu #6 **MACHINE SETUP.** The following menu will be displayed: Machine reference point is also entered at this time.

1. JOB NAME
2. # ROTARY INDEXES
3. # SUBSTRATES
4. DOWN DELAY PLACE
5. UP DELAY EPOXY
6. DOWN DELAY EPOXY
7. UP DELAY EPOXY
8. COMMENT

A. DOT SIZE
B. HOME POINT
C. SET REFERENCES
D. SNAPSTRATE (Y/N)

Items 1-7 should be programmed in the parts placement machine setup.

Items 8-C should be programmed as follows:

8. **COMMENT** - The comment area is used to denote useful nformation for future use, such as the programmers name, the date programmed, etc.

A. **DOT SIZE** - Use the arrowed keys located on the keyboard to determine a box size compatible to the size of the desired epoxy dot.

B. **HOME POINT** - The home point should be programmed so that the epoxy nozzle is just off the edge of rotary indexer/linear table.

C. **SNAPSTRATE** - This section will aid in the production of snapstrates. As explained in Section 3.7 of this manual a "Y" must be programmed to indicate "Yes" under the heading "snapstrate".

Two questions must be answered to describe the snapstrate. The number of horizontal rows and the number of vertical columns.

4.5 EPOXY PLACEMENT PROGRAMMING

From the main menu enter sub menu #5 **TEACH MODE.**

A request will be displayed that asks the operator to "Enter Beginning Sequential Device Number." When programming a new job, all that is necessary is a carriage return.

When editing an existing job, you may at this time move to a specific deposit location by typing in the appropriate sequence number and a carriage return.

The following menu will be displayed:

1. PRINT NAME
2. MATERIAL
3. DEPOSIT TIME
4. NEEDLE SIZE
5. # OF HORIZONTAL DOTS
6. # OF VERTICAL DOTS
7. OUTPUT DWELL
8. VIEW OUTPUT
9. FILL TYPE
10. DISP. SPEED
11. DISPENSE AREA
12. LINE LEN. X, MILS <+/-XXX>
13 LINE LEN. Y, MILS <+/-XXX>

As with the parts placement menu, this menu must be completed in sequence. Although there is no way to skip down to a specific variable, you may use the **"ESC"** key to abort at any time.

1. PRINT NAME This should correspond to the name as programmed in the parts menu for the same bond pad.

2. MATERIAL Enter in a description of the material or a vendors part number. This information will be used later to prompt the operator.

3. DEPOSIT TIME Enter a number (1 - 255). This variable represents the amount of time that the air pressure is active on the epoxy. The size of the epoxy dot is greatly affected by this variable. 50 - 150 is average.

4. NEEDLE SIZE Enter in a number which will be used to prompt the operator in the event of an epoxy tip change.

5. # OF HORIZONTAL DOTS The HA-225 may be programmed to dispense either single dots or material or matrix patterns of material.

If a matrix pattern is required for the first device, enter in the number of dots **(BASED ON THE PREPROGRAMMED DOT SIZE)** necessary to fill the first bond pad.

NOTE: IT MAY BE NECESSARY TO MOVE THE CAMERA OVER THE FIRST BOND SITE TO MAKE THIS ASSESSMENT.

6. # OF VERTICAL DOTS Program the number of dots needed in the vertical axis to accommodate this particular device.

NOTE: IF A SINGLE DOT IS REQUIRED, ENTER 1 FOR EACH AXIS.

7. OUTPUT DWELL Enter a number (1 - 255) ticks. This variable is the amount time the dispenser is down. With some materials it may be necessary to leave the dispenser down longer than the previously programmed **DEPOSIT TIME**. This may prevent stringing of the epoxy. (TICK = 5 ms)

8. VIEW OUTPUT Select whether or not it is required to view.

NOTE: SELECTING "Y" (YES) WILL ADD CONSIDERABLY TO THE OVERALL ASSEMBLY TIME OF EACH CIRCUIT.

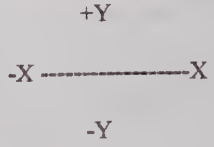
9. FILL TYPE By typing a X,L,or D will determine the tpye of fill used for dispensing epoxy. X = X pattern, L = line, D = a single or matrix of dots.

10. DISP. SPEED This is the speed which the head will travel during dispensing of lines or Xs.
NOTE: This is not used for dots.

11. DISPENSE AREA Using the jog box, position the transfer arm the proper bond pad is viewed in the monitor.

12. LINE LEN. X, MILS <+/-XXX> This is used for lines and Xs to tell the machine how long the lines or how large of an area the X should cover. Only in the X axis direction.

13. LINE LEN. Y, MILS <+/-XXX> This is used for lines and Xs to tell the machine how long the lines or how large of an area the X should cover. Only in the Y axis direction.
NOTE: For lines entering only one direction the machine will draw straight lines in the direction programmed. Entries in both directions wil draw a diagonal line.



If a single dot was programmed, target the bond pad with the center of the crosshairs.

If a matrix was programmed for this deposit location, three instructions will be presented to the operator. See next page.

If a matrix was programmed, the following instructions will be presented to the operator.

1) Find top right corner.

2) Find top left corner.

3) Find bottom right corner.

When the first instruction is presented, the operator should use the jog box to position the crosshairs in the top right hand corner of the bond pad, then press carriage return.

The second instruction will then be presented. At this time, the operator must position the crosshair on the top left hand corner of the bond pad, and carriage return.

The third instruction will be presented. The operator must position the crosshairs at the bottom right hand corner of the bond pad, and carriage return.

NOTE: The center of the crosshair represents the center of the epoxy dot. When positioning at the corners of the bond pad, take into consideration the size of the dot so the epoxy will not be spread out too far.

This completes the epoxy programming for one bond pad.

You will now have the option to edit any of the programmed variables by using the **EDIT** command. If additional programming is needed, continue onto the next sequence. If the programming is complete, use the quit function to exit this mode.

From the main menu, enter into sub menu #4 **(SAVE DATA)** and hit carriage return. Your program is now saved.

4.6 EPOXY DEPOSIT EDITING

The HA-225 is equipped with the three following edit functions:

1) EDIT DEPOSIT LOCATIONS

2) EDIT DEPOSIT PARAMETERS

3) DELETING OR RESEQUENCING

EDIT DEPOSIT LOCATIONS Used for changing the position the epoxy will be dispensed at.

STEP 1. From the main meun, enter into sub menu #1 **AUTOMATIC OPERATION**

STEP 2. From this menu, enter into sub menu #3 **(WALK THROUGH)**. The system will automatically position itself to view the first deposit location. (The crosshair represents the deposit site).

STEP 3. Utilize the XY jog box so the bond pad now appears to be directly centered on the crosshair. Press carriage return.

Utilize the same menu (**TEACH MODE**) and commands. If it is desired to edit only one or two locations, enter the appropriate sequence number after the Teach Mode is entered.

DELETING OR RESEQUENCING Used to eliminate a deposit site or change the order of the existing deposit sites.

STEP 1. From the main menu, enter into sub menu #2 VIEW DATA. The X-Y coordinates, as well as other program information will be viewed on the screen.

DELETE To delete, move the highlighted bar to the word **DELETE**. Press the carriage return again.

MOVE To change the order of sequence, position the highlighted space bar to the word **MOVE**. Press carriage return and enter the sequence to be moved and carriage return again.

The system will now ask the operator the destination for that particular sequence by asking the operator to type the sequence in which to place this one before. Then press carriage return.

To exit this mode press the **"ESC"** key.

To insure that these changes are permanent, use #4 of the Main Menu - **SAVE DATA**.

4.7 SNAPSTRATES

This section will aid in the production of snapstrates. As explained in section 3.6 of this manual a "Y" must be programmed to indicate "yes" under the heading "snapstrate."

Two questions must be answered to describe the snapstrate. The number of horizontal rows and the number of vertical columns.

1 2 3 4 5

2

3

4

To further program snapstrates go back to **Section 3.7C Snapstrates.** This procedure as well as the snapstrate horizontal and vertical data will enable the software to calculate the distance between each particular circuit.

4.8 REJECT SNAPSTRATES

From the main menu, enter #1 **AUTOMATIC OPERATION.**

From this menu, enter #8 **REJECT SNAPSTRATES.**

A question will appear on the screen.

"Do you wish to clear all snapstrate rejects? (Y/N).

Simply type a "Y" for yes on "N" for no in response to this question.

A carriage return is not necessary. The following menu will be displayed.

STATUS	HORIZONTAL	VERTICAL	SUBSTRATE
ENABLE	1	1	1

CIRCUITS TOTAL HORIZONTAL = 2
CIRCUITS TOTAL VERTICAL = 2
TOTAL SUBSTRATES = 8
GRAND TOTAL CIRCUITS = 32
GRAND TOTAL REJECT CIRCUITS = 0

STATUS - represents the status of that particular snapstrate.

ENABLE - represents a good one.

REJECT - represents a bad one.

HORIZONTAL - represents the horizontal position in which the system is presently located.

VERTICAL - represents the vertical position in which the system is presently located.

SUBSTRATE - represents which substrate the system is presently located.

The **STATUS** of a snapstrate can only be changed when the system is presently located at that particular position, indicated by the **HORIZONTAL** and **VERTICAL** headings.

The **STATUS** of a snapstrate is changed by utilizing the "backspace key".

The **HORIZONTAL** and **VERTICAL** heading can be changed by utilizing the arrowed keys on the right hand side of the keyboard.

The **SUBSTRATE** count can be changed by utilizing the carriage return key.

When the data of this menu satisfies the needs of the operator, the menu can be exited by utilizing the **"ESC"** key.

SECTION 5 OPERATIONS

5.1 INTRODUCTION

In this section, we will be building complete circuits. Your normal parts kit will be required:

1. Devices 2. Substrates 3. Epoxy

Note: If the substrates are already prescreened, then proceed to section 5.5 **PRODUCT SET UP (PARTS MENU).**

5.2 PRODUCT SET UP (EPOXY MENU)

At this point in time, the operator must be at the main menu of the Epoxy Deposit program. From the main menu, enter into the sub menu #1 **AUTOMATIC OPERATION.**

The following menu, the **OPERATE MENU** will be displayed.

1. Sequential Deposit
2. Set Variable Reference Points
3. Walk Through
4. Prototype Build
5. Index Output Table
6. Main Menu
7. Parts Placement
8. Reject Snapstrates

NOTE: This step is not necessary if a linear workholder option is being used.

Enter into sub menu #5 **INDEX OUTPUT TABLE**, press the carriage return twice and the output table will advance. Each time the carriage return is pressed, the output table will index one position.

This will facilitate mounting the substrates onto the table. Secure each substrate well with the magnetic clamp. When all the substrates are secured, type the **"ESC"** key and the system will return to the Operate Menu.

Note: The number of rotary indexes is dependent upon the number which was programmed under the heading (#6 Machine Setup) from the main menu. **See Section 4.3 EPOXY DEPOSIT PROGRAMMING.**

5.3 SET VARIABLE REFERENCE POINTS (EPOXY MENU)

Machine reference point must be entered at this time.

Enter into sub menu #2 **SET VARIABLE REFERENCE POINTS** from the Operate Menu. Using the X-Y jog box, position the transfer head so the crosshair is positioned over the reference point selected **ON THE CIRCUIT** which was programmed in the Machine Setup mode from the main menu.

Hit the carriage return and repeat until the reference point has been set for each substrate.

5.4 EPOXY DEPOSIT

When dispensing material, you may select one of two options:

1) Sub menu #4 **(PROTOTYPE DEPOSIT)** will deposit the epoxy on a single circuit and then wait for the operator to issue another command.

2) Sub menu #1 **(SEQUENTIAL DEPOSIT)** will dispense epoxy on all of the circuits on the rotary indexer\linear table.

NOTE: IF AT ANY TIME YOU WISH TO STOP THE DISPENSER, HIT THE SPACE BAR.

Prior to activating the dispensing cycle, there are six possible functions in which the operator may choose at this time.

The functions are located at the bottom of the monitor and are the following:

RUN - This selection will activate the dispensing cycle.

CHECK - This selection will dispense epoxy at the first location which then can be checked.

VIEW - This selection enables the operator to view the deposit location prior to depositing as well as after depositing.

PURGE - This selection will activate the dispensing mechanism for one cycle. This can be used to flow epoxy thru a new collet.

SKIP - This function is used to skip deposit locations. If more than two deposit locations were to be skipped, the operator would press the **"ESC"** key.

The system would then ask which substrate you would like to advance to. The operator would enter the substrate number and carriage return.

The system would then ask which sequence number you would like to advance to. The operator would then enter the sequence number and carriage return.

The system will continue from that device onward.

QUIT - This selection will exit to the operate menu. The operator could then proceed to the main menu.

After all the epoxy has been deposited, you will have the option of either replacing the substrates and using the **CONTINUE** command to deposit more epoxy.

NOTE: IF THE METALIZATION ON THE SUBSTRATES IS NOT ACCURATE, THE REFERENCE POINTS MAY HAVE TO BE RESET FOR EACH TRAY OF SUBSTRATES. SEE SECTION 5.3 SET VARIABLE REFERENCE POINTS.

The other option is to use the **QUIT** command which will bring you back to the Operate Menu.

From the Operate Menu, typing a "7" and carriage return will bring you to the Parts Placement Menu.

5.5 PRODUCT SET UP (PARTS MENU)

At this point in time, the operator must be at the main menu of the Parts Placement program.

From the main menu, enter into the sub menu #1 (Automatic Operation).

The following menu will be displayed (this is the Operate Menu):

1. Suquential build
2. Set Variable Reference Points
3. Walk Through
4. Prototype Build
5. Index Output Table
6. Main Menu
7. Epoxy Deposit
8. Reject Substrates

Enter into sub menu #5 (**INDEX OUTPUT TABLE**). Press the carriage return key or footswitch twice and the output table will advance.

Each time the carriage return is pressed, the output table will index one position. This will facilitate mounting the substrates if they haven't been mounted yet.

Secure each substrate well with the vacuum\magnetic clamp. When all the substrates are secured, type the **"ESC"** key and the system will return to the Operate Menu.

5.6 SET VARIABLE REFERENCE POINTS (PARTS MENU).

Enter into sub menu #2 **SET VARIABLE REFERENCE POINTS** from the Operate Menu.

Machine reference point is also enter at this time.

Using the X-Y jog box, position the pick up head so the crosshair is centered on the reference point selected on the circuit which was programmed in the **MACHINE SET UP** mode from the main menu.

Press the carriage return and repeat until the reference point has been set for each substrate.

5.7 PARTS PLACEMENT

From the Operate Menu, you may select one of two sub menus for placing the devices:

1) Sub menu #4 (**PROTOTYPE BUILD**) will enable you to place all the devices on a particular substrate without the rotary\linear indexer repositioning to the next substrate.

2) Sub menu #1 (**SEQUENTIAL BUILD**) will enable you to populate each substrate with a particular device before asking for he next style device.

The screen will instruct the operator to set the zoom lens to a particular magnification and select a collet. (if your HA225 is equipped with a rotary collet exchanger).

Simply place the first device to be bonded in the window on the monitor, then press either the footswitch or carriage return to initiate a pick cycle.

NOTE: THE BELL SIGNIFIES A CHANGE IN DIE TYPE.

With the placement of each device, you will have the following options:

CONTINUE - Will initiate the next pick cycle.

VIEW - Will view the bond location prior to placement. If this mode is used, the operator will also be able to view the placement of that device if desired.

RETRY - This command is used if a die had been missed and the die detection was turned on. It enables the operator to repick the die.

SKIP - This function is used to skip bond locations. If more than two bond locations were to be skipped, then the operator would press the "ESC" key.

The system would then ask which substrate you would like to advance to.
The operator would type in the appropriate substrate number and carriage return.

The system would then ask which device number you would like to advance to.

The operator would then type in the appropriate device number and carriage return.

The system will now continue from that device on.

QUIT - Will exit to the Operat Menu. From there, the operator could proceed to the main menu.

SECTION 6 MAINTENANCE

To maintain the equipment at its highest level of performance the following lubrication operations should be performed.

X-Y TABLE - Every 120 hours of operation, apply a few drops of **"STAZON"** lead screw oil to the X-Y table lead screws. This will help prevent wear, binding, or misstepping in the X-Y table.

SINGLE AXIS OUTPUT STATION - Every 120 hours of operation, apply a few drops of **"STAZON"** lead screw oil to the lead screw. This will help prevent wear, binding or misstepping of the output station.

CHECK COLLETS PERIODICALLY - Collets should be checked each day before operation begins. This will help prevent damage to any of the parts being picked with a dirty collet. The face of a collet may become embedded with silicone dust and may scratch the surface of sensitive devices such as transistors.

KEEP TABLE TOP CLEAN - It is always suggested to keep the surface area where operators are working as clean as possible. This will not only increase productivity but it will prevent mistakes during the build process.

6.3 ZOOM LENS ADJUSTMENT

Refer to the TV CAMREA ASSY drawing FIG. 6.1.

1. Move an image under the camera and set it to the proper operating height.

2. Zoom the lens to the maximum magnification by rotating the zoom knob till the largest number is displayed in the zoom window. (item 1)

3. Focus the image using the mechanical focus knob on the machine head.

4. Zoom the lens to the minimum magnification or smallest number displayed in the zoom window. (item 1)

5. Adjust the parfocal ring on the camera to focus the image by loosening the 2 philips head screws on the ring and rotating the ring then retighten the screws. (item 2)

6. Repeat steps 1-5 as needed. The image should stay in focus through the entire travel of the zoom lens.

7. Ensure the crosshair on the composite monitor is in the center of the image area of the screen.

8. Move an image under the camera. Line up a dot in the image to the center of the crosshair while the the zoom lens is at the lowest magnification or smallest number displayed in the zoom window. (item 1)

9. Zoom the lens to the highest magnification and note the direction the dot moves with respect to the center of the crosshair.

10. Move the dot in the opposite direction that it moved with respect to the center of the crosshair. The center of the dot will now be on the opposite side of the center crosshair.

11. Zoom down to the minimum magnification. (item 1)

12. Place the point of a pen on the monitor at the center of the dot. Zoom up to the maximum magnification and note that the center of the dot remains fixed to the point of the pen. Do not be concerned that the center of the dot no longer lines up with the center crosshair. If the center of the dot continues to move, move the dot in the opposite direction until the center of the dot remains fixed when the zoom lens is changed.

13. The center of the dot is now in the center of the zoom lens. The center of the crosshair is in the center of the camera. Using the 3 allen set screws at the top of the zoom lens (item 3) adjust the camera center (center crosshair) to alien to the zoom lens center (center of the dot). Use 3 .050" allen wrenches. Always loosen 1 screw and tighten 2 screws, or loosen 2 screws and tighten 1 screw. Never loosen all three screws at the same time.

14. Repeat steps 7-13 as needed.

15. Ensure the the camera is square to the table movement.

16. When finished ensure that all hardware is properly tightened.

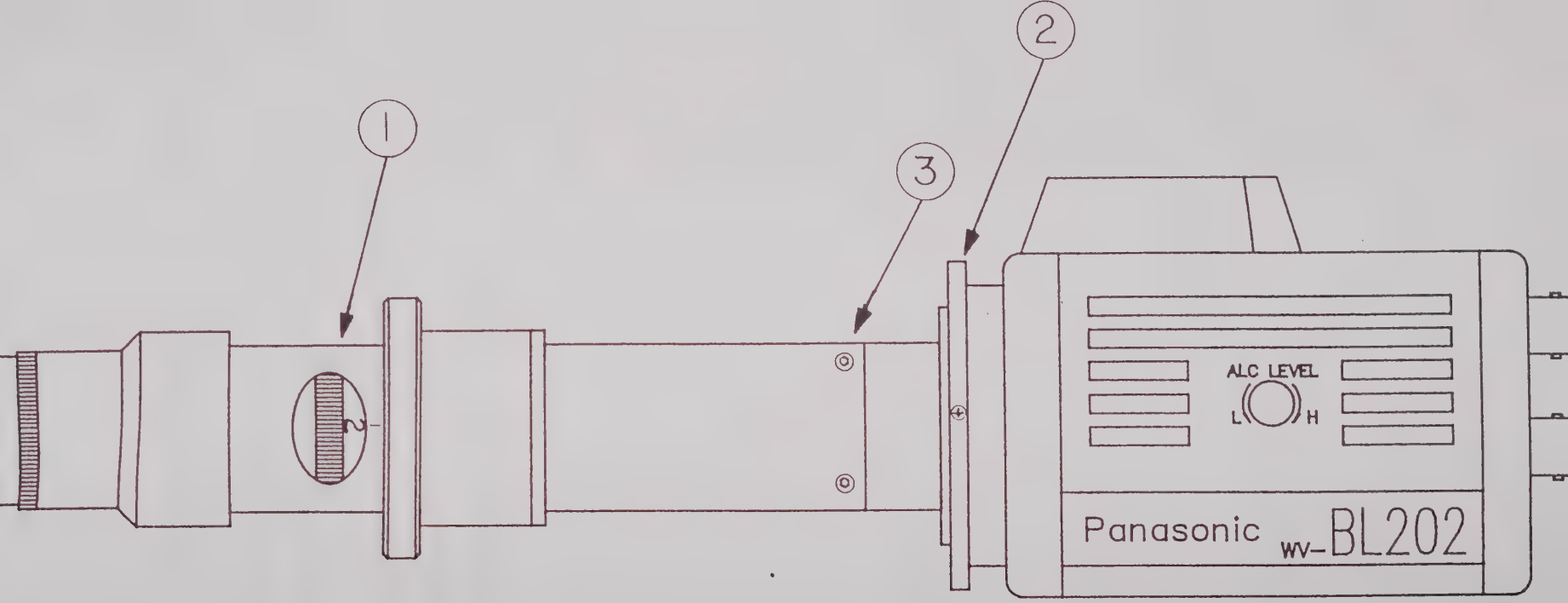


FIG. 6-1

6.4 MACHINE NOTES

1) The linear output table may be sent to the home position by holding down the 2 key on the jog box and pressing the down arrow key on the jog box.

2) At any time, the software can be reset by simultaneously pressing (control - alt - delete) keys.

3) From the main menu, enter #9 **MANUAL OPERATION**. From this menu, enter #1 **SEND STRING COMMAND**.

From this menu, different functions can be turned on and off simply be typing in a particular command.

The following is a list of commands which may be helpful at any time.

Each one of these commands must be typed in with capital letters followed by a carriage return.

CV1 = COLLET VACUUM ON

CV0 = COLLET VACUUM OFF

S11 = EPOXY PRESSURE ON

S10 = EPOXY PRESSURE OFF

PU1 = COLLET PURGE ON

PU0 = COLLET PURGE OFF

BL1 = SEATING PRESSURE ON

BL0 = SEATING PRESSURE OFF

VT0 = VACUUM DETECTION CALIBRATION

CA1 = OUTPUT CAMERA ON

CA0 = INPUT CAMERA ON

CM1 = PICK UP COLLET DOWN

CM0 = PICK UP COLLET UP

S21 = EPOXY COLLET DOWN

S20 = EPOXY COLLET UP

6.5 MACHINE CYCLE

1. On power, the arm and output station, go to "home" position.
2. Computer will power up and test ram then come up with HA-225 software menu. (Parts place) The HA program will be loaded.
3. Output station is indexing to the first index position.
4. The output station moves the header to the place position.
5. Arm moves to the pick up.
6. Chip picks up collet, goes down.
7. The vacuum is turned on after the collet stops down position.
8. Collet moves up with the chip on it.
9. Sensor checks the collet up position.
10. A chip sensing vacuum sensor is turned on. If the chip is on the collet, the vacuum will be high. If the chip is not on the collet, the vacuum will be low.
11. Arm moves to place position.
12. Collet, with the chip on it, moves down.
13. Vacuum off, pressure on to deposit the chip.
14. Collet up, pressure off.
15. Vacuum off, pressure on, collet purge.
16. Pressure off.

This is the end of the cycle.

6.6 SPECIFICATIONS

X-AXIS

1.	Travel	- 4 inches
2.	Speed	- 100 pulses/second max
3.	Type of driver	- stepper
4.	Resolution	- 0.000139"
5.	Horizontal Accuracy	- +/- 0.00025 in/in
6.	Vertical Accuracy (flatness)	- +/- 0.00025 in/in
7.	Lead Accuracy	- 0.00025 in/in
8.	Repeatability (bidirectional)	- 0.00005 in.

Y-AXIS

1.	Travel	- 8 inches
2.	Speed	- 170 pulses/second max
3.	Type of driver	- stepper
4.	Resolution	- 0.000139"
5.	Horizontal Accuracy	- +/- 0.0001 in/in
6.	Vertical Accuracy (flatness)	- +/- 0.0001 in/in
7.	Lead Accuracy	- 0.0001 in/in
8.	Repeatability (bidirectional)	-0.0005 in.

6.7 MAJOR COMPONENT DESCRIPTION

EPOXY Z-HEAD ASSEMBLY

The epoxy head is the second half of the overall dispensing system mounted on the transfer arm carriage. The epoxy dispensing tip is mounted in a tip holder via collar and "O" ring. The 1cc cartridge is held to the tip collar via a compression spring. The tip holder is riding on a linear motion slide which is mounted to the main bracket via mounting plate. The slide with the dispensing tip on it is driven by a linear actuator mounted on a bracket. The drive unit is engaged with the slide via dash pot, slot in the tip holder and adjusting screw.

The outside diameter of the dispensing tip is 0.010 which determines the maximum size of the epoxy dot, and a 0.003" hole diameter which relatively determines the volume of dispensed epoxy.

SPECIFICATIONS

1. Stroke size - 0.125 adjustable
2. Resolution - 0.002"
3. Dwell time - Programmable
4. Dwell time - 5 msec. resolution
5. Dot diameter - 0.0007" min

PICK/PLACE Z HEAD ASSEMBLY

The assembly is needed to perform the following functions:

1. Pick up the chip.
2. Deposit a chip.
3. Apply deposit pressure if needed.

This assembly is driven by a dash pot assembly. The vacuum collet is assembled in a housing via one precision bearing and retainer rings. The vacuum collet has a 0.0009" outside tip diameter and a 0.0006" diameter hole (min) to a 0.030" outside tip diameter and 0.017" diameter hole (max). The collet housing is mounted to a linear slide via mounting plate. The slide is loaded to the top against the vertical stop. The vertical down stop is adjustable to control overtravel.

On the top end of the collet is pressed on a sprocket which rotates the collet holder for collet selection. The system is designed for a 0.100" overtravel. The total Z head is mounted on a precision linear slide to provide the Z-motion.

SPECIFICATIONS:

1.	Total Z-collet stroke	- 0.3" adjustable
2.	Resolution	- 0.001"
3.	Resolution	- +/- 0.5 degrees
4.	Total Collet Overtravel	- 0.100" adjustable
5.	Collet Concentricity	- 0.0002"
6.	Z-slide Straightness of travel	- 0.00004" per inch

PLUMBING ASSEMBLY

The plumbing assembly consists of 6 solenoid valves, vacuum sensor, 5 pressure regulators, and pressure gauge. All these components are mounted on bracket. The main function of this system is to supply vacuum and pressure to the solenoids for collets, dash pots and miscellaneous accessories.

Vacuum is supplied from an outside vacuum source of 25" Hg minimum which comes to the vacuum manifold. From the vacuum manifold, the vacuum line goes to vacuum solenoids and input table. After the solenoid valve, the line goes to the vacuum sensor and to the collet.

Air pressure is supplied from an outside source of 50 psi minimum and comes to the pressure regulators where it gets adjusted to 3 psi or as required, via the test button and the corresponding function button.

After the regulator, the regulated pressure line goes to pressure gauge and to solenoid valves. From the solenoids, the line goes to the collet and dash pots.

As the collet is going to pick up a chip, the pick solenoid is turned on. Sensor is sensing the level of vacuum to check if the collet (vacuum level is high). At place point the Z goes down and the deposit solenoid is turned on to assist the deposit to the device.

When the chip is deposited the purge solenoid valve is turned on and pressure is applied to the collet to clean it.

SPECIFICATIONS:

1. Vacuum Supply - 25" Hg. min.
2. Pressure Supply - 50 psi min.
3. Working Vacuum Level - 25" Hg.
4. Working Pressure Level - 3-15 psi.

6.8 TROUBLESHOOTING SECTION

This section is intended to guide service personnel in a trouble- shooting sequence that will result in a minimum of system downtime. It cannot anticipate every possible problem, but it does describe the most likely faults and their solutions.

A) Is the LED transistor firing?
B) Are power supply voltages correct?
C) Are all connectors fully seated?
D) Problem could be in computer making it necessary to replace at board level.

If the LED lights up but the function does not occur, the problem could be one of the following:

A) Solenoid
B) No air or vacuum
C) Power supply voltage
D) Loose connector

By analyzing the lights, it will be possible to ascertain where the problem is with some degree of accuracy.

TROUBLESHOOTING CHART

SYMPTOM:	Cycle does not start when footswitch is press
PROBABLE CAUSE(S):	Not plugged into proper I/O port. (Game Port) Open footswitch circuit.
CORRECTION:	Insure that footswitch is plugged in. Replace the footswitch.
SYMPTOM:	"Z" will not go down.
PROBABLE CAUSE(S):	Air supply is not on or not connected. Insufficient pressure. Faulty air hoses. Faulty components.
CORRECTION:	Connect or turn on air supply. Adjust regulator. Inspect air hoses, repair or replace. Observe DS1 on SD 16 PCB; it should light when the arm goes down if not, fault is between DS1 and the "Z" solenoid.
SYMPTOM:	Machine will not pick up die.
PROBABLE CAUSE(S):	Vacuum not on or not connected. Vacuum solenoid is not on. Pick-up tip does not contact die, tip binding in up position. Pick-up tip does not contact die, insufficient "Z" travel. Pick-up tip does not contact die, die tray is too low.
CORRECTION:	Connect and/or turn on vacuum source. Observe DS2 on SD 16 PCB. It is lit when the vacuum is turned on (starting before pick up at the bottom of pick/place "Z"). If DS2 lights up, the solenoid circuit is faulty; if D2 does not light, the control circuit is faulty. Inspect tip, spring and guide bushing to determine cause of binding. Replace worn or damaged part. Determine cause of insufficient travel (limit stop or insufficient "Z" pressure). Adjust travel stop or "Z" pressure as necessary. Adjust die tray height.

SYMPTOM:	Die sticks to pick-up tip.
PROBABLE CAUSE(S):	Deposit air puff is not on. Vacuum is on. Insufficient puff pressure.
CORRECTION:	Observe DS3 on SD16 PCB. The air puff and DS3 should turn on at end of deposit "Z". Observe DS2 on SD16 PCB. Vacuum should go off at end of "Z" deposit. Adjust deposit regulator.

SYMPTOM:	Breaking die.
PROBABLE CAUSE(S):	Excessive "Z" travel. Excessive "Z" pressure.
CORRECTION:	Adjust lower "Z" travel limit. Adjust "Z" regulator for fast, smooth action.

SYMPTOM:	Erratic die deposit.
PROBABLE CAUSES(S):	Pick-up tip not reaching the bottom of the tray cavity, tip binds in up p position. Insufficient "Z" travel.
CORRECTION:	Inspect tip and guide bushing to determine cause of binding. Replace worn or damaged part. Adjust "Z" travel so the tip has approximately .010" overtravel when placing the die in the bottom of the tray. Anvil height should be adjusted the equivalent amount. This will prevent excessive "Z" travel at the pick-up point.

SYMPTOM:	Transfer Arm will not move.
PROBABLE CAUSES(S):	X-Y table is resting on limit switches. Faulty stepper motor. Faulty stepper driver.
CORRECTION:	Reset to home, wish to re-program. Check stepper motor. Check stepper driver. Contact Laurier Incorporated.

SECTION 7 - OPTIONAL EQUIPMENT (IF APPLICABLE)

THIS SECTION DOES NOT APPLY TO
YOUR HA-225 PLUS EPOXY DIE BONDER

SECTION 8 - MATERIAL LISTS AND DRAWINGS

MASTER ML

B9018876	X-Y TRANSFER ASSEMBLY
A9018897	ROTARY COLLET ASSEMBLY
A9000036	FLUOROWARE TRAY ASSEMBLY
A9009254	ROTARY TRAY ASSEMBLY
B9005257	MANUAL POSITIONING STATION
B9009214	ALIGNMENT ELECTRONICS
C9009369	VACUUM DETECTION & VIDEO SWITCH BOARD ASSEMBLY
A9005061	STEPPER MOTOR ASSEMBLY
A9015628	SENSOR TO INTERFACE BOX CABLE
B9012973	VACUUM GAUGE ASSEMBLY
A9012195	SOLENOID VALVE ASSEMBLY
A9009432	DC HARNESS ASSEMBLY
A9009433	AC HARNESS ASSEMBLY
A9018986	MONITOR ASSEMBLY, T.T.L.
B9019134	OUTPUT CAMERA ASSEMBLY
B9018871	INPUT CAMERA ASSEMBLY
B9019133	Y-ARM ASSEMBLY
B9018885	LINEAR OUTPUT STATION
D0015640	SYSTEM DIAGRAM
A4019277	SYSTEM WIRING DIAGRAM
A4015994	DOMESTIC WIRING
B9015874	EPOXY DISPENSE KIT
B9015867	SOLENOID VALVE TO MAX CABLE
B9018883	CONTROL BOX ASSEMBLY

SECTION 8 - MATERIAL LISTS AND DRAWINGS (CONT.)

B8019434	FIXTURE .100 X .400
B8019435	FIXTURE 3 & 8 PIN PACKAGE
B8019559	FIXTURE 16 PIN PACKAGE
A8000254	COLLET - SMALL
A8000020	COLLET - MEDIUM
A8000072	COLLET - LARGE

SCHEMATICS

C9009369	VACUUM DETECTION & VIDEO SWITCH BOARD
B9015868	PLUMBING ASSEMBLY
A4014709	LIGHT SOURCE WIRING DIAGRAM
B9018884	VALVE TO CONTROLLER CABLE

LAURIER® INCORPORATED

TITLE: HA-225 PLUS

MACHINE: AT&T #2282

EFFECTIVE :

REVISION A:
B:
C:
D:

ML- 0019104

ITEM	QTY	DWG. NO.	DESCRIPTION	MANUFACTURER	REMARKS	REV	PURCH. DATA DUE	REQ	ORD
1	1	B901887 6	X-Y TRANSFER ASS'Y						
		A900506 1	STEPPER MOTOR ASS'Y						
		A901 5628	LIMITS TO CONTROLLER CABLE						
2	1	B901913 3	Y-ARM ASS'Y						
		A901 2973	VACUUM GAUGE ASS'Y						
3	1	B901913 4	OUTPUT CAMERA ASS'Y						
4	1	B901887 8	BASE CONSOLE ASS'Y						
		B901271 5	KEYBOARD SHELF ASS'Y						
		D901 1483	BASE ASS'Y						
		A900 6768	LEVEL PAD ASS'Y						
5	1	A900991 1	FOOTSWITCH ASS'Y						
6	1	A900525 7	MANUAL POSITION BOX						
		A900515 0	CABLE, I/O BRD TO MAN. POS. BOX						

LAURIER® INCORPORATED

TITLE: HA 225 PLUS

MACHINE:

EFFECTIVE :

REVISION A:
B:
C:
D:

ML- 0019104

LTR	QTY	DWG. NO.	DESCRIPTION	MANUFACTURER	REMARKS	REV	PURCH. DATA DUE	REQ	ORD
7	1	B901887 9	UPPER FRAME ASS'Y						
8	1	A901898 6	MONITOR ASS'Y TTL						
9	1	A901888 1	MONITOR ASS'Y COMPOSITE						
10	1	C901289 2	INPUT FRAME ASS'Y						
11	1	B901887 1	INPUT CAMERA ASS'Y						
12	1	-901898 5	COMPUTER ASS'Y						

LAURIER® INCORPORATED

TITLE: HA 225 PLUS

MACHINE:

EFFECTIVE :

REVISION A:
B:
C:
D:

ML- 0019104

ITEM	QTY	DWG. NO.	DESCRIPTION	MANUFACTURER	REMARKS	REV	PURCH. DATA DUE	REQ	ORI
13	1	C 901 8805	CONTROLLER						
		900 4980	I/O BOARD						
		901 8820	X CONTROLLER BOARD						
		901 8821	Y CONTROLLER BOARD						
		901 8822	Z CONTROLLER BOARD						
		901 8818	LIMIT SWITCH INTERFACE BRD.						
		901 8814	POWER SUPPLY PANEL						
		901 8823	COMMUNICATION CABLE						
15	1	B 901 8883	CONTROL BOX ASS'Y						
		A 901 2000	VARIABLE TRANSFORMER ASS'Y						
		A 901 2195	SOLENOID VALVE ASS'Y						
		B 901 8884	VALVE TO CONTROLLER CABLE						
		B 901 5868	PLUMBING ASS'Y						
16	1	A 901 8886	ILLUMINATOR ASS'Y		INPUT				
17	1	A 901 9135	ILLUMINATOR ASS'Y		OUTPUT				

LAURIER® INCORPORATED

TITLE: HA-225 PLUS

MACHINE:

EFFECTIVE :

REVISION A:
B:
C:
D:

ML-0019104

LTLX	QTY	DWG. NO.	DESCRIPTION	MANUFACTURER	REMARKS	REV	PURCH. DATA DUE	REQ	ORD
18	1	B900924	ALIGNMENT ELECTRONICS						
		C900936	VACUUM DETECT & VIDEO SW. BD.						
		B900941	CABLE, DIGITAL INTERFACE						
		B900942	CABLE, RS232						
		B900942	CABLE, TTL I/O						
		A900942	CABLE, CAMERA 1 VIDEO INPUT						
		A900942	CABLE, CAMERA 2 VIDEO INPUT						
		A900942	CABLE, PCHG VIDEO INPUT						
		A900942	CABLE, PCHG VIDEO OUTPUT						
		A900942	CABLE, VACUUM SENSOR #1						
		A900943	CABLE, VACUUM SENSOR #2						
		A900943	CABLE, RESET						
		A900943	CABLE, DC HARNESS						
		A900943	CABLE, AC HARNESS						
		A900945	CABLE, RS232 COMMUNICATION						
		A900946	CABLE, TTL I/O INTERFACE						
19	1	-701	HA225 W/ OUTPUT						

LAURIER® INCORPORATED

TITLE: HA-225 PLUS

MACHINE:

EFFECTIVE :

REVISION A:
B:
C:
D:

ML-0019104

ITEM	QTY	DWG. NO.	DESCRIPTION	MANUFACTURER	REMARKS	REV	PURCH. DATA DUE	REQ	ORD
			OPTIONS						
20	1	B901885	LINEAR OUTPUT STATION	ASSY					
21	1	A901897	ROTARY COLLET ASSY-6						
22	1	A900925	ROTARY TRAY ASSY						
23	1	A9000036	DIE COLUMN						
24	1	B901587	EPOXY DISPENSE KIT						
25	1	B901940	WORKHOLDER ASSY						
26	1	A9000006	DIE DISH COLUMN ASSY						
27	1	-101242	PRESSURE GAUGE 0-60 PSI		(EPOXY)				
			ACCESSORIES						
30	1	A8000254	COLLET, SMALL DELRIN						
31	1	A8000020	COLLET, MEDIUM DELRIN						
32	1	A8000072	COLLET, LARGE DELRIN						
33	1	-101872	COLLET, VESPEL SP-211						
34	1	B801943	FIXTURE, .100 x .400 CERAMIC						
35	4	B801943	FIXTURE, 3 & 8 PIN PACKAGE						
36	4	B801955	FIXTURE, 16 PIN PACKAGE						

LAURIER® INCORPORATED

TITLE: X-Y TRANSFER ASSY 5x8

MACHINE: HA 225 PLUS

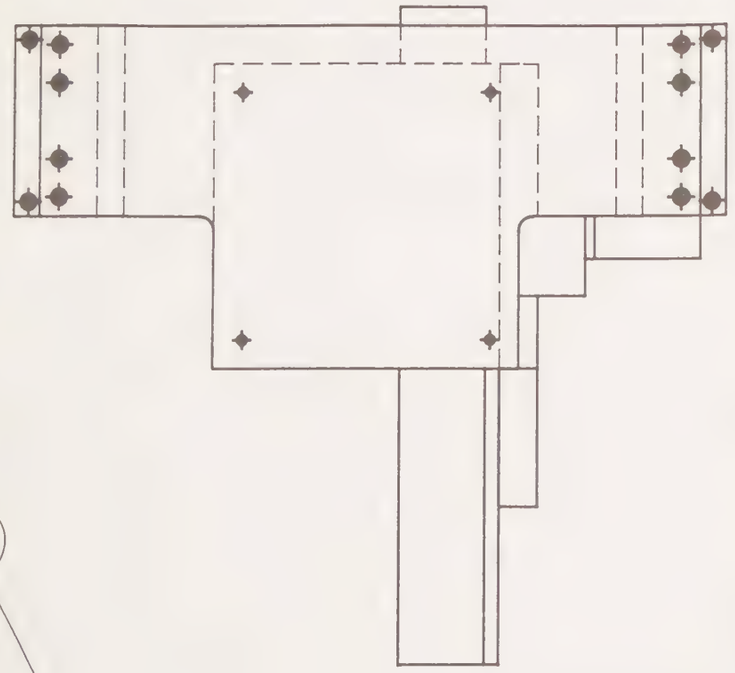
EFFECTIVE : _____

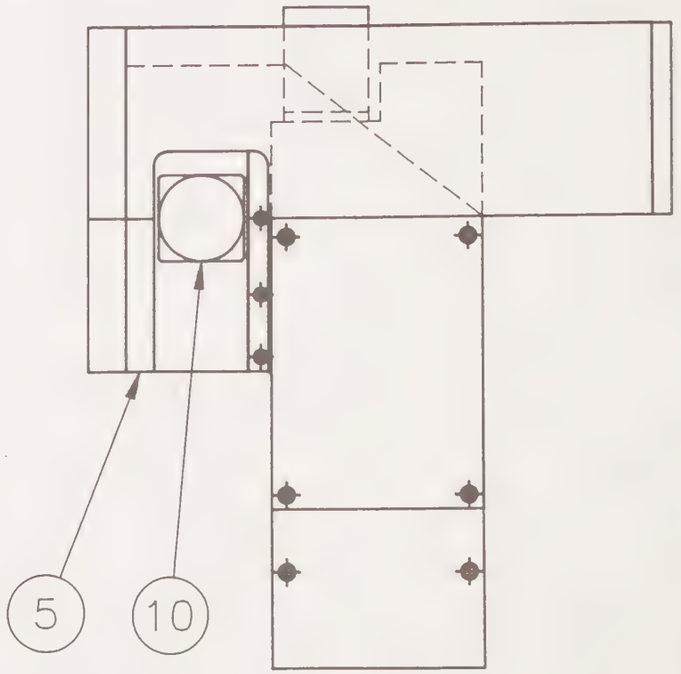
REVISION A: _____
B: _____
C: _____
D: _____

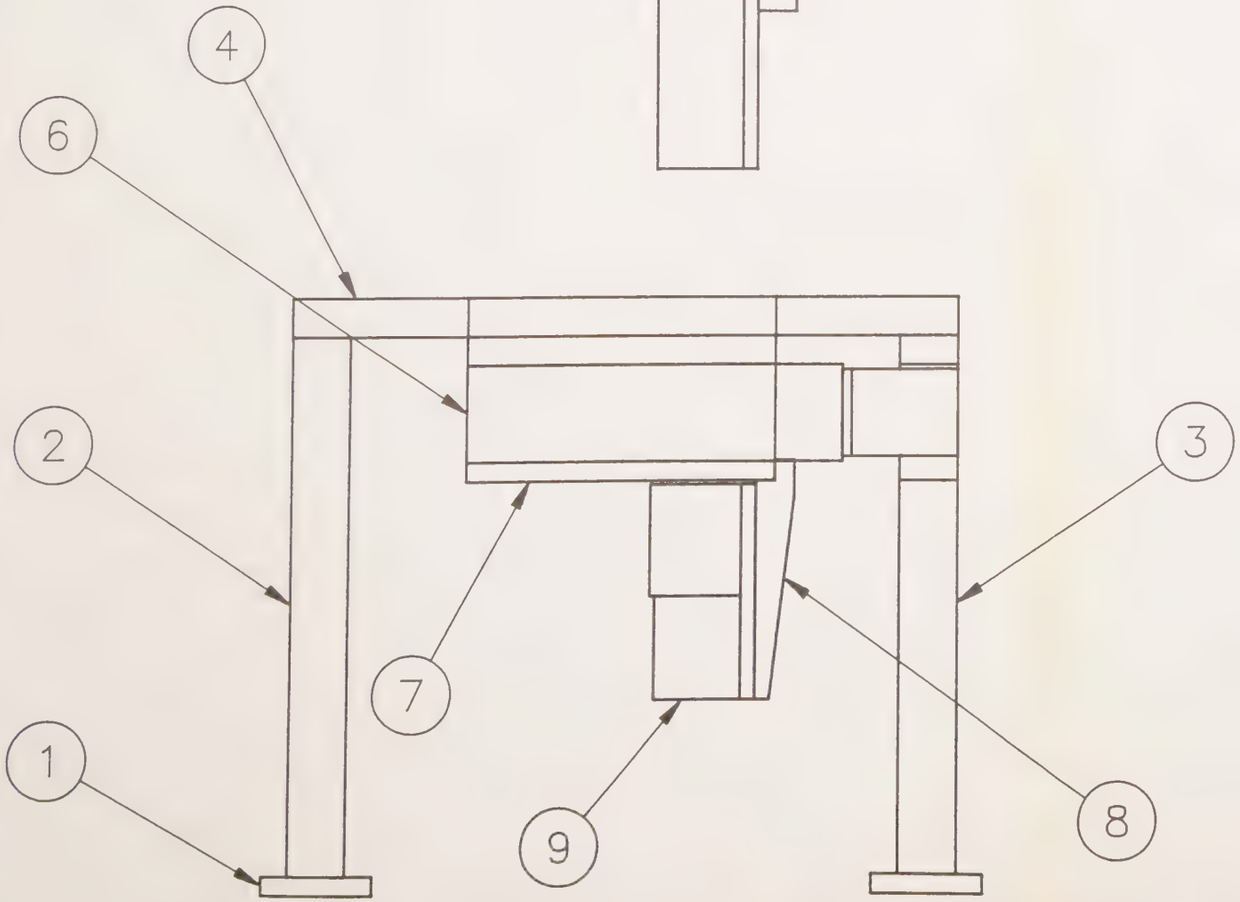
ML-B9018876

PAGE 1 OF

ITEM	QTY	DWG. NO.	DESCRIPTION	MANUFACTURER	REMARKS	REV	PURCH. DATA DUE	REQ	ORD
1	2	B801080 0	BASE						
2	1	C801080 3	POST (LEFT SIDE)						
3	1	C801127 3	POST (RIGHT SIDE)						
4	1	D801080 4	PLATE						
5	1	A800863 5	TABLE SPACER BLOCK						
6	1	-101287 4	TABLE, 5" TRAVEL	SEE PROD SPEC	X				
7	1	C801258 9	PLATE - X						
8	1	C801258 8	PLATE - Y						
9	1	-101287 3	TABLE, 8" TRAVEL	SEE PROD SPEC	Y				
10	2	A900506 1	STEPPER MOTOR ASSY						
11	2	A901562 8	LIMITS TO CONTROLLER CABLE						
12									
13	23	E07062	SCREW						
14	12	E07112	SCREW						
15	4	E07092	SCREW						
16									
17									
18									
19									
20									







TOP PLATE ON ITEM 9 IS REMOVED

TOLERANCES (EXCEPT AS NOTED)	REVISIONS		
	NO.	DATE	BY
DECIMAL .X = .1 ±.XX = .01 .XXX = .005	1		
	2		
FRACTIONAL ± 1/64	3		
	4		
ANGULAR ± 1°	5		
	6		

LAURIER INC.

X–Y TRANSFER ASS'Y

DRAWN BY	SCALE	MATERIAL
C. GIGUERE	1/4	
CHK'D	DATE 6/19/92	DRAWING NUMBER 9018876
TRACED	APP'D	

LAURIER® INCORPORATED

TITLE: ROTARY COLLET ASS'Y 6 POSITION

MACHINE: HA 225 PLUS

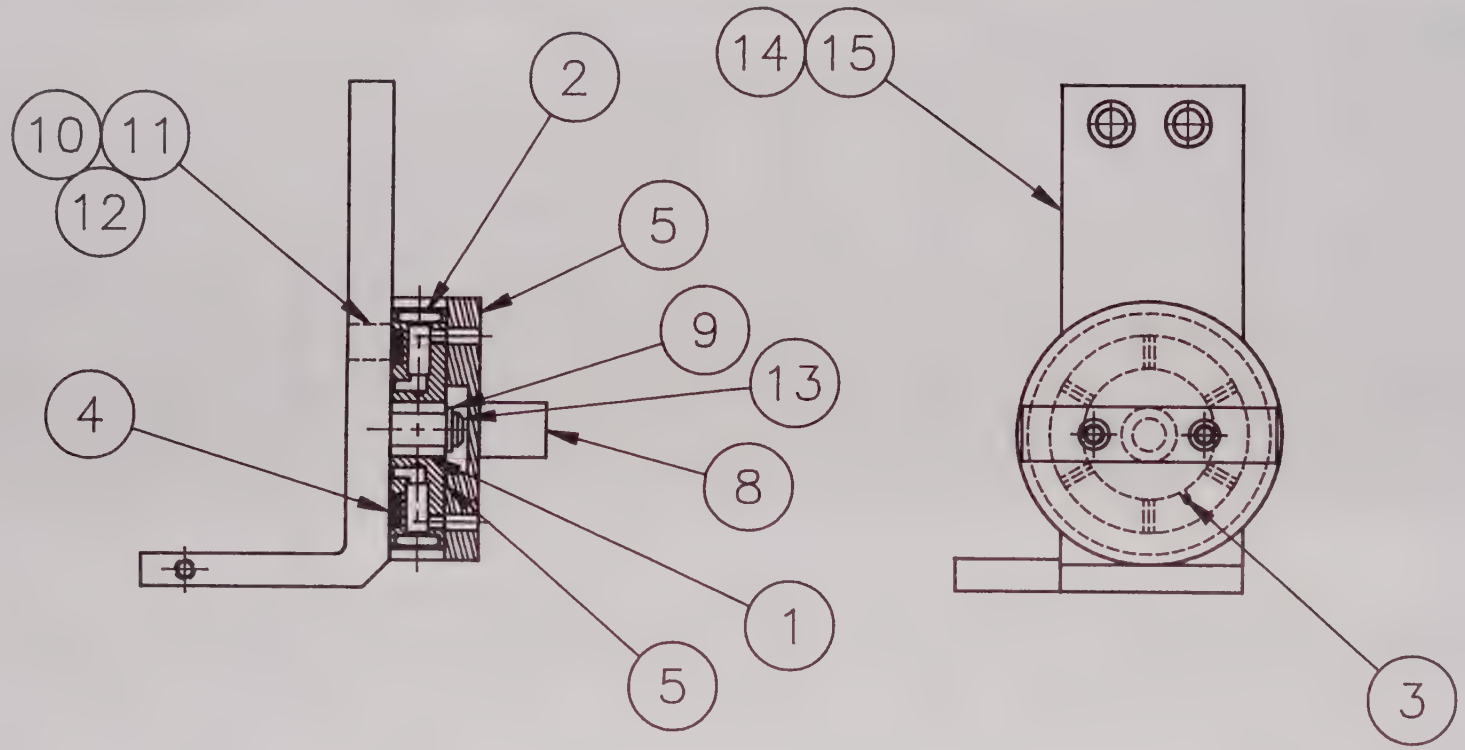
EFFECTIVE : _____

REVISION A: _____
B: _____
C: _____
D: _____

ML-A9018897

PAGE 1 OF 1

ITEM	QTY	DWG. NO.	DESCRIPTION	MANUFACTURER	REMARKS	REV	PURCH. DATA DUE	REQ	ORD
1	1	-101291 7	BUSHING, DRILL 3/16 ID						
2	6	-100012 3	O RING 1/4 OD						
3	1	-101256 5	PIN, 1/32 DIA						
4	1	A801890 4	RING, INDEXER						
5	1	A801890 5	CAP						
6	1	B801890 6	INDEXER						
7	6	R02002	SCREW, SET 2-56 x 1/16 AL						
8	1	A801900 7	HANDLE						
9	1	-101291 8	RET RING, 3/16 SHAFT						
10	1	-101291 9	BUSHING, DRILL 3/32 ID						
11	1	-101292 0	BALL .09375 OD						
12	1	-101292 1	SPRING						
13	1	A301255 7	SHAFT REWORK 3/16 OD						
14	1	B801263 5	BRACKET, Z PICK						
15	1	-101448 8	FITTING, L 10-32 5/64 ADJ						



TOLERANCES (EXCEPT AS NOTED)	REVISIONS		
DECIMAL .X = .1 .XX = .01 ± .XXX = .005	NO.	DATE	BY
FRACTIONAL ± 1/64	1		
ANGULAR ± 1°	2		
	3		
	4		
	5		
	6		

LAURIER INC.

ROTARY COLLET ASS'Y

DRAWN BY	SCALE	MATERIAL
C. GIGUERE	FULL	
CHK'D	DATE 5/6/92	DRAWING NUMBER 9018897
TRACED	APP'D	

8½ X 11 PRINTED ON NO. 1000H CLEARPRINT ●

Laurier Associates, inc

TITLE: FLOUROWARE DIE COLUMN ASSY

MACHINE: SA220

ML-A90000360

PAGE 1 OF 1

ITEM	QTY.	DWG NO.	DESCRIPTION	MANUFACTURER	REMARKS
1.	1	B800031 1	DIE TRAY COLUMN		
2.	1	A8000007 1	ADJUSTABLE RING		
3.	1	A8009858	RIGHT SPRING CLIP		
4.	1	A8009859	LEFT SPRING CLIP		
5.	.25	-1000021	TEFLON TAPE		
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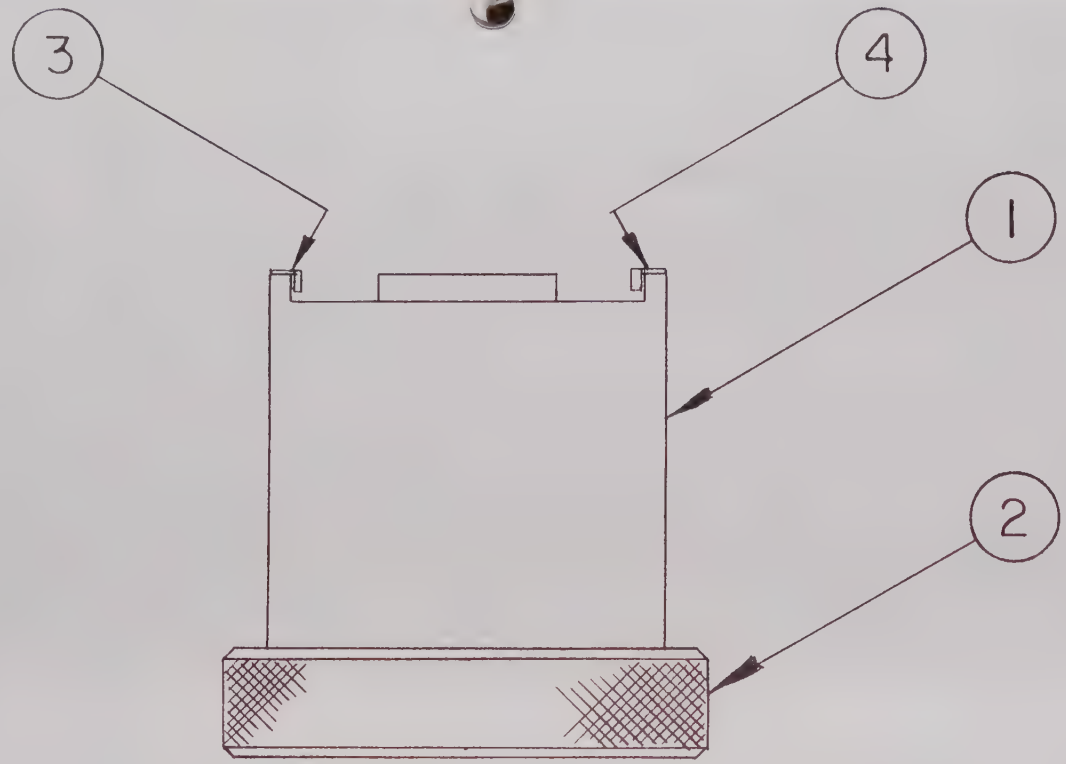

TOLERANCES (EXCEPT AS NOTED)
DECIMAL ±
FRACTIONAL ±
ANGULAR ±

REVISIONS		
NO.	DATE	BY
1		
2		
3		
4		
5		

LAURIER ASSOC. INC.

FLOUROWARE DIE COLUMN

DRAWN BY S.LAFORGE	SCALE FULL	MATERIAL ~
CHK'D	DATE 3-26-84	DRAWING NO. 9000036
TRACED	APP'D	

NATIONAL NO. 195E-8½X11

Laurier Associates, inc

TITLE: ROTARY TRAY Assy.

MACHINE: HA 225

ML- A9009254

PAGE 1 OF 1

ITEM	QTY.	DWG NO.	DESCRIPTION	MANUFACTURER	REMARKS
1.	1	A800925 2	TOP PLATE		
2.	1	B801113	INPUT CHUCK PLATE		
3.	2	-100482 3	BEARING		
4.	1	A800455 8	PLUG		
5.	1	A800925 3	GLASS PLATE		
6.	3	A301048 1	RUBBER BUMPER - MODIFIED		
7.	1	-100017 8	FITTING		
8.	1	-101137 4	O-RING 4.0 I.D.	#345 BUNA	50 DURO
9.	1	-101137 5	O-RING 5.0 I.D.	#353 BUNA	50 DURO
10.					
11.					
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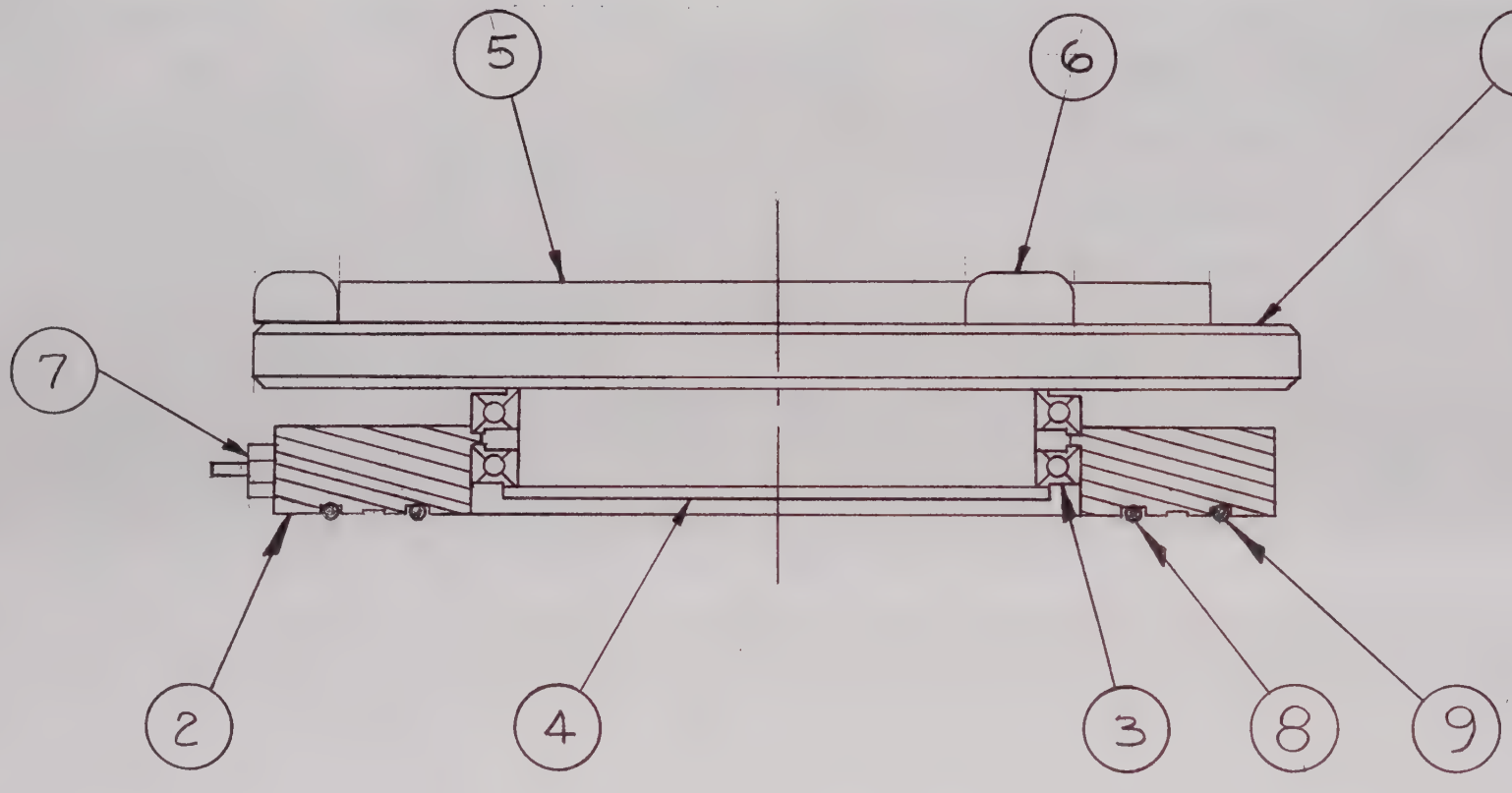
REV 1-ADDED ITEM 7 4-23-86

REV 2-ADD O-RINGS



TOLERANCES (EXCEPT AS NOTED)	REVISIONS			LAURIER ASSOCIATES, INC.		
	NO.	DATE	BY			
DECIMAL ±	1	4-23-86	L.D.	ROTARY TRAY ASSY		
	2	8-11-87				
FRACTIONAL ±	3			DRAWN BY C GIGUERE	SCALE FULL	MATERIAL ~
	4			CHK'D	DATE 2-6-86	DRAWING NO. 9009254
ANGULAR ±	5			TRACED	APP'D	

NATIONAL NO. 185E-8½X11

Laurier Associates, inc

TITLE: MANUAL POSITIONING STATION

MACHINE:

ML-B90[illegible]5257

PAGE 1 OF 1

ITEM	QTY.	DWG NO.	DESCRIPTION	MANUFACTURER	REMARKS
1.	1	B300525 8	BUD BOX REWORK	BUD BOX #CU234	10052116
2.	1	-1600733 6	P.C. BOARD		
3.	1	-2005269	40 PIN HEADER	3M #3495-2002	
4.	7	-2004799	SWITCH	EAO #99-451	
5.	2	-1000019 6	STANDOFF		#6-32 x 3/4LG
6.	4	-1000135	BUMPER		
7.	1	A3010111	SWITCH CAP		1
8.	1	A3010112	SWITCH CAP		2
9.	4	A3010108	SWITCH CAP		→
10.	1	A3010124	SWITCH CAP		FAST
11.	1	A9005150	I/O BD TO MANUAL POSITIONING STA CABLE		
12.					
13.					
14.					
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17.					
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20.	REF	A4005263	SCHEMATIC AUX SWITCH BD.		
21.					
22.					
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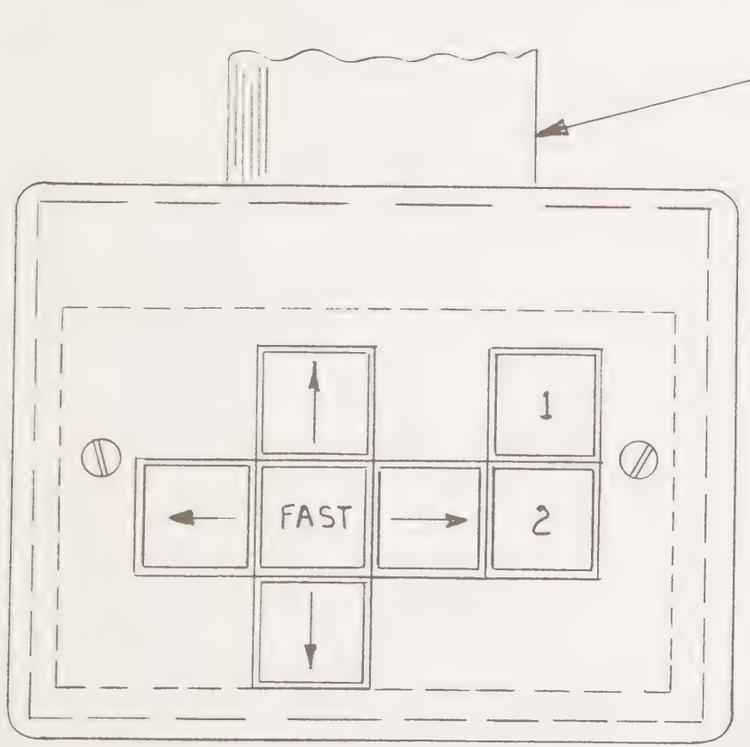
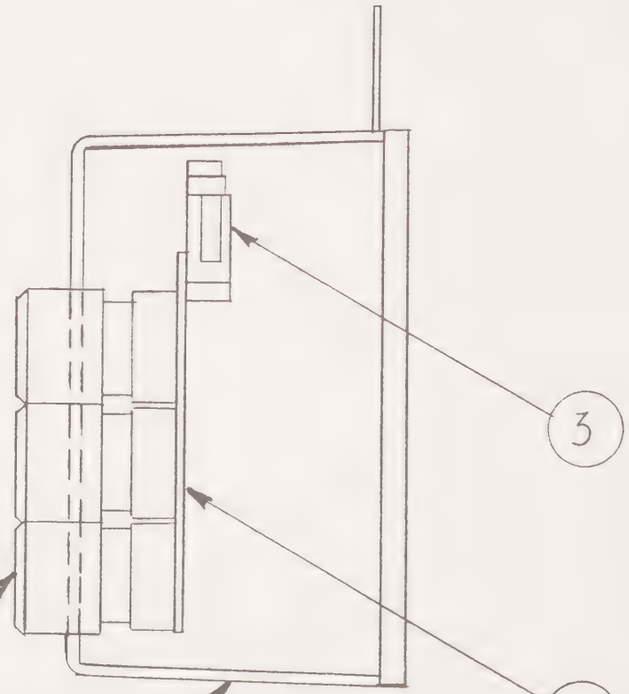
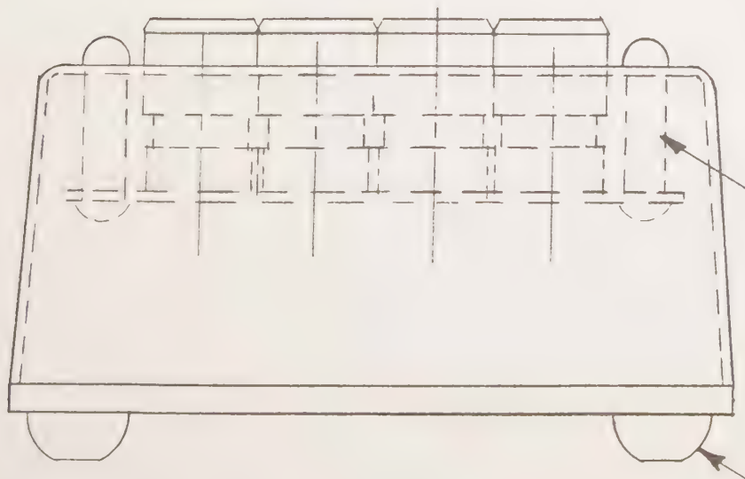
26.					







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REDRAWN 12-9-86

TOLERANCES (EXCEPT AS NOTED)	REVISIONS		
	NO.	DATE	BY
DECIMAL ±	1		
	2		
FRACTIONAL ±	3		
	4		
ANGULAR ±	5		

LAURIER INC.

MANUAL POSITIONING STATION

DRAWN BY	SCALE	MATERIAL
L. DUBAY	FULL	—
CHK'D	DATE	DRAWING NO.
TRACED	APP'D	9005257

Laurier Associates, inc

TITLE: ALIGNMENT ELECTRONICS

MACHINE: HA225

ML-B9009214

ITEM	QTY.	DWG NO.	DESCRIPTION	MANUFACTURER	REMARKS
1.					
2.	1	D8009361	BOTTOM PLATE		
3.	1	C9009369	VACUUM DETEC + VIDEO SWITCH BOARD		
4.	1	-2009391	PCHG-8 BOARD ASSY	AMS	
5.	1	-2009392	POWER SUPPLY		
6.	11	-1000196	STANDOFF		
7.	1	-2000011	LINE CORD		
8.	1	-2000067	STRAIN RELIEF		
9.	4	-1000068	STANDOFF		
10.	1	B9009414	DIGITAL INTERFACE CABLE		J8
11.	1	B9009423	RS232 CABLE		J7
12.	1	B9009424	TTL I/O CABLE		J9
13.	1	A9009425	CAMERA 1 VIDEO INPUT CABLE		J1
14.	1	A9009426	CAMERA 2 VIDEO INPUT CABLE		J2
15.	1	A9009427	PCHG VIDEO INPUT CABLE		P8-J3 PCHG
16.	1	A9009428	PCHG VIDEO OUTPUT CABLE		J3
17.	1	A9009429	VACUUM SENSOR #1 CABLE		J5
18.	1	A9009430	VACUUM SENSOR #2 CABLE		J6
19.	1	A9009431	RESET CABLE		J4
20.	1	A9009432	DC HARNESS ASSY		
21.	1	A9009433	AC HARNESS ASSY		
22.	1	-2001618	RESET SWITCH		S1
23.	1	-2008404	FUSE 1AMP S/B		F1
24.	1	-2000013	FUSE HOLDER		
25.					
26.					

Laurier Associates, inc

TITLE: ALIGNMENT ELECTRONICS

MACHINE: HA 225

ML-B9009214

ITEM	QTY.	DWG NO.	DESCRIPTION	MANUFACTURER	REMARKS
27.	1	A9009459	RS232 COMMUNICATION CABLE		J7
28.	1	A9009460	TTL I/O INTERFACE CABLE		J9
29.	11	-2005060	#6 FIBER WASHER		
30.	1	-2005811	RESISTOR 1/4 W 5% 1.2K		
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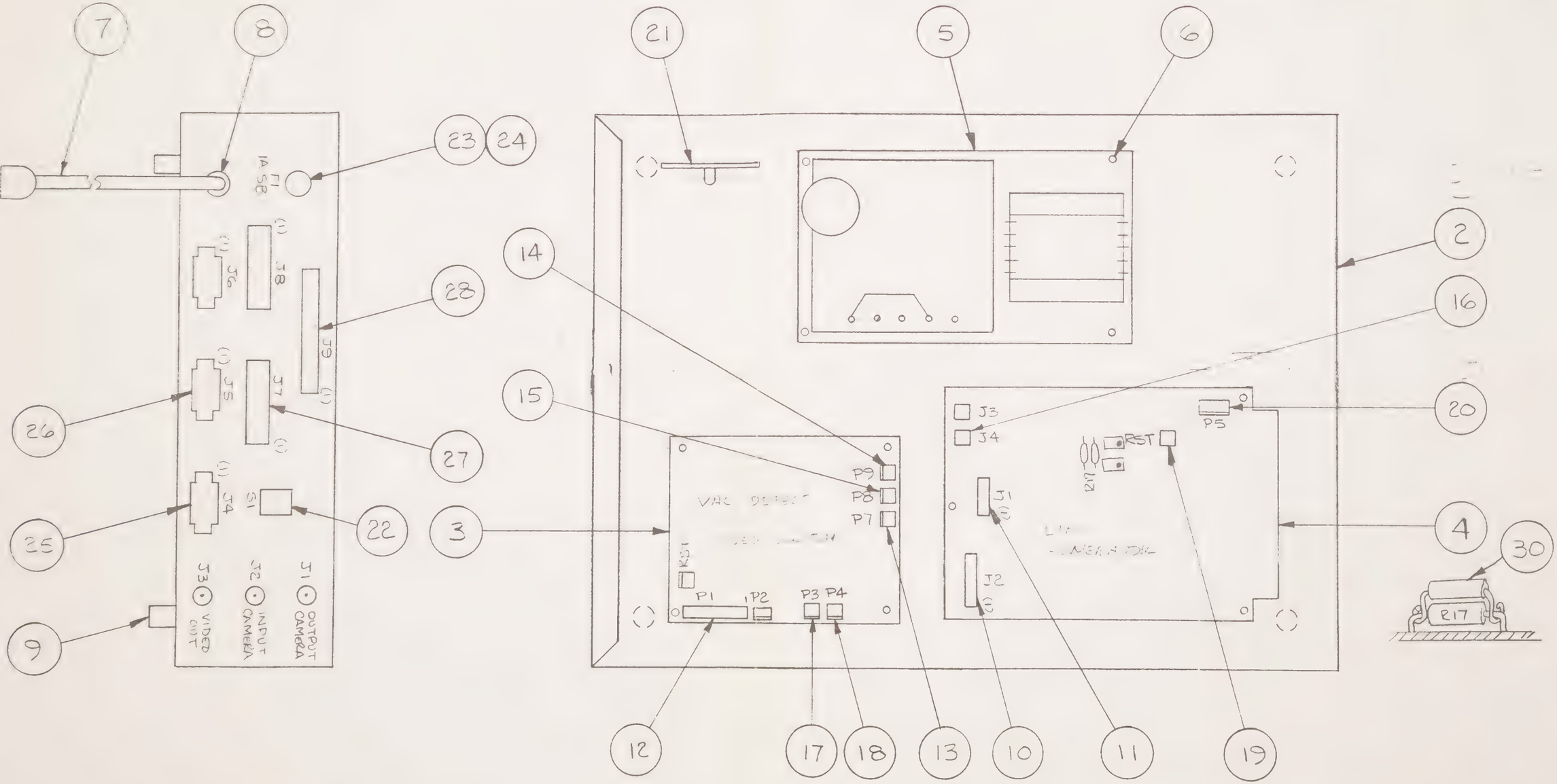


ITEM 1 - COVER NOT SHOWN

ITEM 30 - INSTALL ON ITEM 4 AS SHOWN TO REDUCE VIDEO GAIN BELOW 1.0, WHEN R17 IS 2K OR GREATER

ITEM 5 - JUMPER "-OUT" TO "COM" AS SHOWN

① REPLACED RUBBER FEET WITH STANDOFFS

TOLERANCES (EXCEPT AS NOTED)	REVISIONS			LAURIER ASSOCIATES, INC.		
DECIMAL ±	NO.	DATE	BY	ALIGNMENT ELECTRONICS		
	1	8-1-89	CG			
FRACTIONAL ±	2					
	3			DRAWN BY C GIGUERE	SCALE ≈ 1/2	MATERIAL —
ANGULAR ±	4			CHK'D	DATE 3-10-86	DRAWING NO. 9009214
	5			TRACED	APP'D	

NATIONAL NO. 185E-11X17

Laurier Associates, inc

TITLE: VACUUM DETECTION & VIDEO SWITCH BOARD ASSY

MACHINE: HA225

ML-C9009369

ITEM	QTY.	DWG NO.	DESCRIPTION	MANUFACTURER	REMARKS
1.	1	-6009368	VIDEO SWITCH PCB		
2.	1	-2006409	IC 8031AH		U1
3.	1	-2004862	IC 74LS373		U2
4.	1	-7010299	E PROM FOR VAC. DET. BOARD		U3
5.	1	-2009439	IC LM 339N		U4
6.	2	-2005324	TRANSISTOR 2N3904		Q1, Q4
7.	2	-2001621	TRANSISTOR 2N3906		Q2 Q3
8.	1	-2007735	DIODE ZENER 1N4372		D7
9.	6	-2002052	DIODE 1N4148		D1 - D6
10.	1	-2005817	RESISTOR 8.2K		R1
11.	1	-2001660	RESISTOR 47K		R2
12.	1	-2005772	RESISTOR 51Ω 1/4W		R3
13.	8	-2004781	RESISTOR 4.7K		R4-R7, R9, R10
14.	1	-2005811	RESISTOR 1.2K		R8
15.	2	-2009442	POTENTIOMETER 25K		R11, R12
16.	3	-2009443	CAPACITOR 22μf @ 16V		C1, C2, C13
17.	2	-2009444	CAPACITOR 30pf @ 25V		C3, C4
18.	2	-2004783	CAPACITOR 10μf @ 16V		C5, C12
19.	3	-2009445	CAPACITOR .01μf @ 100V		C6, C10, C11
20.	2	-2002018	CAPACITOR .1μf @ 50V		C7, C9
21.	2	-2009446	CAPACITOR 2.2μf @ 16V		C13, C14
22.	1	-2004993	CONNECTOR SOCKET 14 PIN		K1
23.	1	-2009447	RELAY SIGMA 191 TE1C1-5S		K1
24.	1	-2004853	CONNECTOR SOCKET 28 PIN		U3
25.	1	-2004854	CONNECTOR SOCKET 40 PIN		U1
26.	1	-2007678	CRYSTAL 11.0592 MHZ		Y1

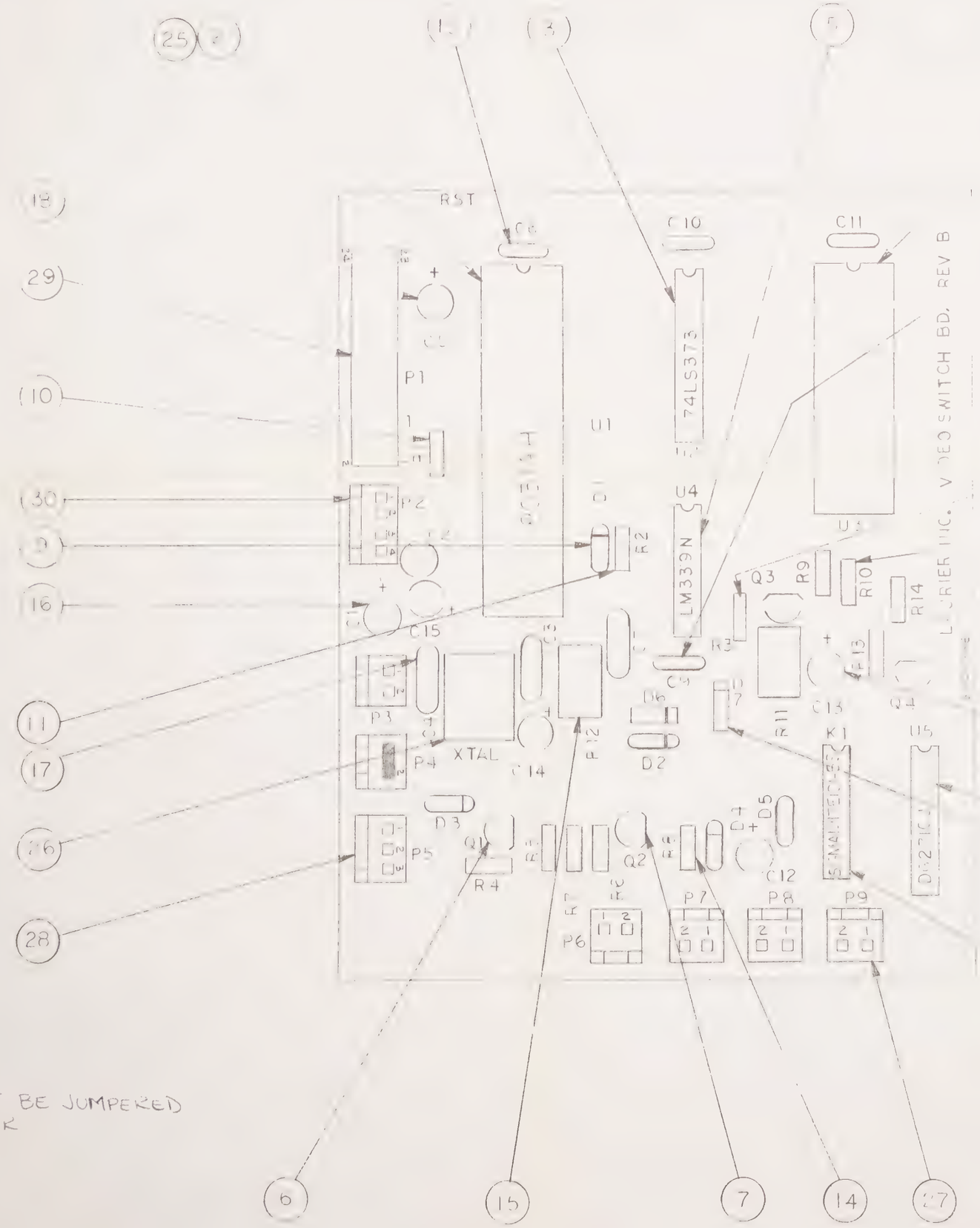
Laurier Associates, inc

TITLE: VACUUM DETECTION & VIDEO SWITCH BOARD ASSY

MACHINE: HA 225

ML-C9009369

ITEM	QTY.	DWG NO.	DESCRIPTION	MANUFACTURER	REMARKS
27.	6	2009448	CONNECTOR MALE 2 POS	MOLEX	P3, P4, P6-P9; RST
28.	1	2014050	CONNECTOR MALE 3 POS	MOLEX	P5
29.	1	-2007759	BERG STRIP 12 POS		P1,
30.	1	-2014051	CONNECTOR MALE 4 POS	MOLEX	P2
31.	1½"		WIRE-BUSS 26 AWG		Y1
32.	1	-2004855	CONNECTOR SOCKET 16 PIN		U5
33.					
34.					
35.					
36.					
37.					
38.					
39.					
40.					
41.					
42.					
43.					
44.					
45.	REF	C400937D	VACUUM DETECT + VIDEO S.W. SCHM		
46.					
47.					
48.					
49.					
50.					
51.					
52.					



NOTE (3)

P4 MUST BE JUMPERED TOGETHER

(3) ADDED NOTE AND JUMPER PER DJF
REDRAW 3-12-87

REF C4009370 FOR SCHEMATIC

TOLERANCES (EXCEPT AS NOTED)	REVISIONS			LAURIER INC.			
	NO.	DATE	BY				
DECIMAL ±	1	2-19-87	786	VACUUM DETECTION AND VIDEO SWITCH BOARD ASSY.			
	2	3-24-87	776				
FRACTIONAL ±	3	6-10-91	CG	DRAWN BY L. DUBAY	SCALE 2X	MATERIAL	
ANGULAR ±	4			CHK'D	DATE 3-12-87	DRAWING NO. 9009360	REV. B
	5			TRACED	APP'D		

NATIONAL NO. 1885-17X22

LAURIER® INCORPORATED

TITLE: STEPPER MOTOR Assy

MACHINE:

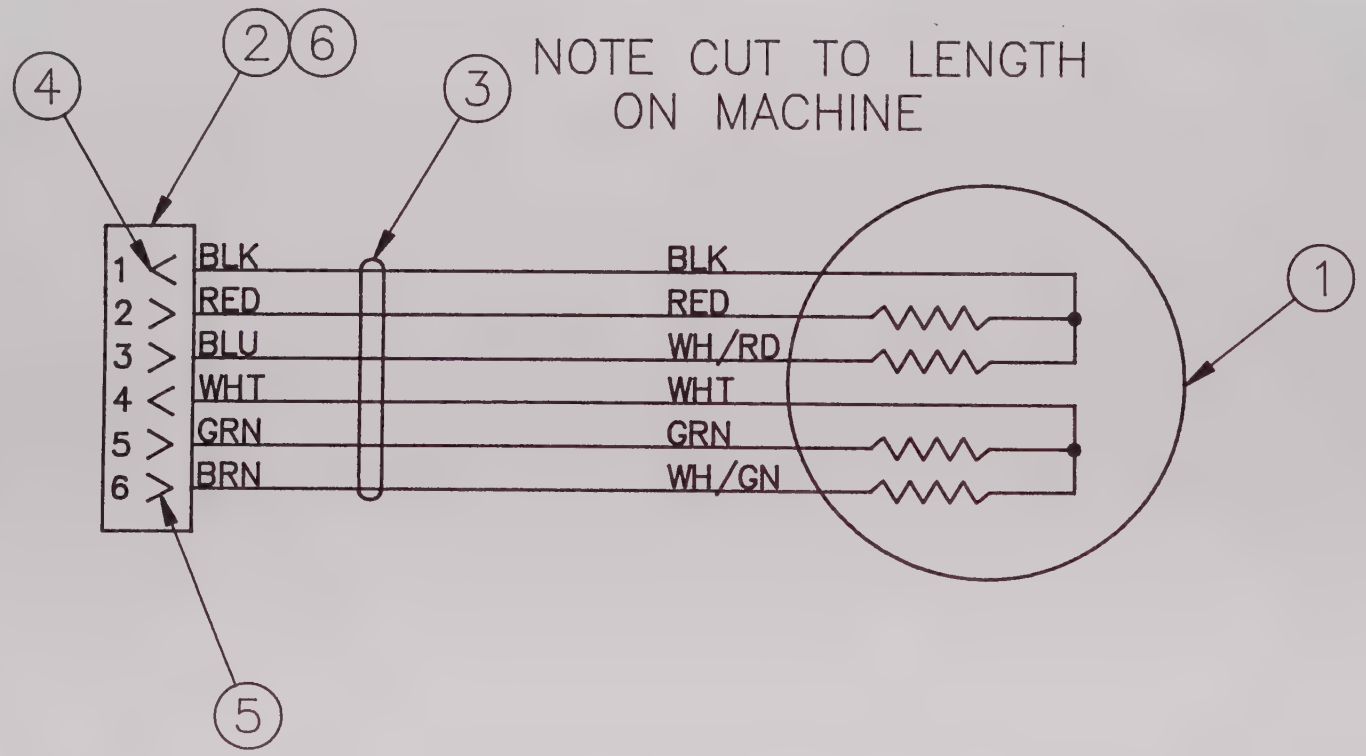
EFFECTIVE : _____

REVISION A: _____
B: _____
C: _____
D: _____

ML-A9005061

PAGE 1 OF 1

ITEM	QTY	DWG. NO.	DESCRIPTION	MANUFACTURER	REMARKS	REV	PURCH. DATA DUE	REQ	ORD
1	1	-2004699	STEPPER MOTOR		M062-FC03				
2	1	-2004846	HOOD						
3	3FT	-2005136	CABLE		CUT TO LENGTH				
4	2	-2004825	CONTACT - PIN						
5	4	-2004856	CONTACT - SOCKET						
6	1	-2004828	PLUG						



TOLERANCES (EXCEPT AS NOTED)	REVISIONS		
	NO.	DATE	BY
DECIMAL .XX = .01 ± .XXX = .005	1		
	2		
FRACTIONAL ± 1/64	3		
	4		
ANGULAR ± 1°	5		
	6		

LAURIER INC.

STEPPER MOTOR ASSY

DRAWN BY	SCALE	MATERIAL
S. LAFORGE	NONE	
CHK'D	DATE 11/15/91	DRAWING NUMBER 9005061
TRACED	APP'D	

8½ X 11 PRINTED ON NO. 1000H CLEARPRINT •

LAURIER® INCORPORATED

TITLE: SENSOR TO INTERFACE BOX CABLE

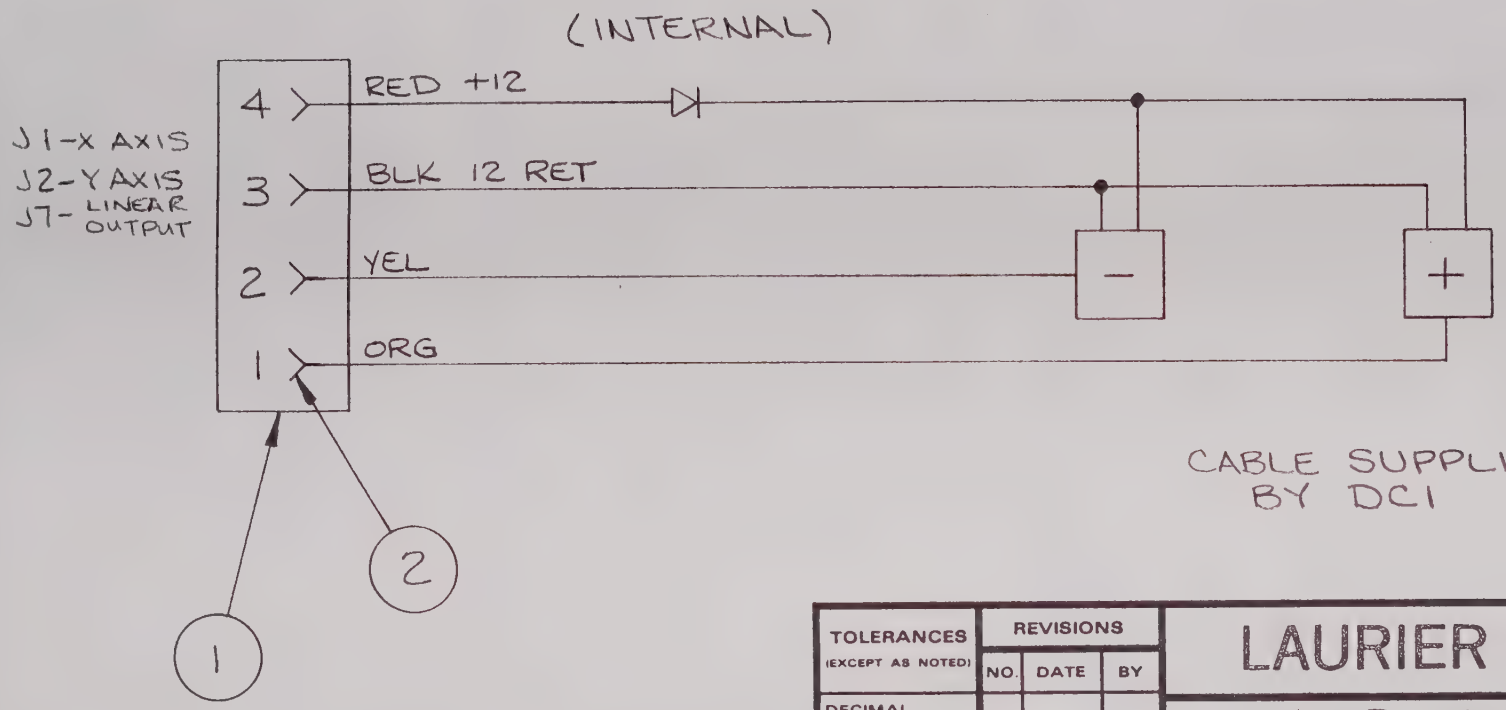
MACHINE:

EFFECTIVE :

REVISION A:
B:
C:
D:

ML-A9015628

LTLM	QTY	DWG. NO.	DESCRIPTION	MANUFACTURER	REMARKS	REV	PURCH. DATA DUE	REQ	ORD
1	1	-2004824	CONNECTOR, 6 PIN						
2	4	-2004730	PIN, FEMALE						
3									
4									



CABLE SUPPLIED BY DCI

TOLERANCES (EXCEPT AS NOTED)	REVISIONS NO.	DATE	BY
DECIMAL ±	1		
	2		
FRACTIONAL ±	3		
	4		
ANGULAR ±	5		
	6		

LAURIER INC.

SENSOR TO INTERFACE BOX CABLE

DRAWN BY CGIGUERE	SCALE —	MATERIAL —
CHK'D	DATE 6-16-89	DRAWING NUMBER 9015628
TRACED	APP'D	

8½ X 11 PRINTED ON NO. 1000H CLEARPRINT ●

LAURIER® INCORPORATED

TITLE: VAC GAUGE ASSY

MACHINE:

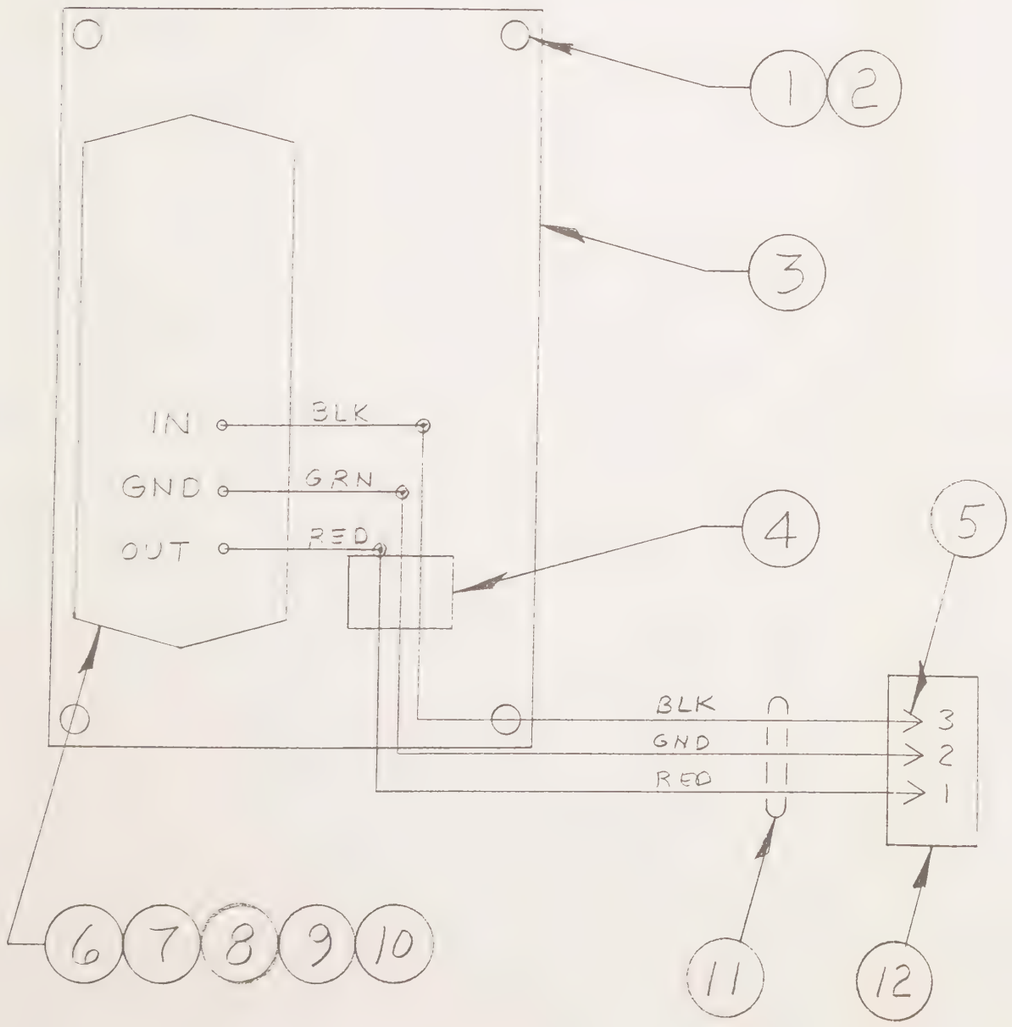
EFFECTIVE :

REVISION A:
B:
C:
D:

ML-B9012973

PAGE 1 OF 1

ITEM	QTY	DWG. NO.	DESCRIPTION	MANUFACTURER	REMARKS	REV	PURCH. DATA DUE	REQ	ORD
1	4	-1012976	STANDOFF						
2	4	-E04032	SCR. 4-40 X 1/4						
3	1	A3012790	VAC GAUGE BD.						
4	1	-1009658	STRAIN RELIEF						
5	3	-2004734	PIN MALE						
6	1	-2008771	GAUGE, VACUUM						
7	2	-P04091	SCR. 4-40 X 1.0 L						
8	2	-SW1041	WASH. FL. #4						
9	2	-FW0041	WASH. LCK #4						
10	2	-NK0411	NUT #4						
11	10'	-2005159	CABLE						
12	1	-2004878	CONN. 3 P MALE						



TOLERANCES (EXCEPT AS NOTED)	REVISIONS		
	NO.	DATE	BY
DECIMAL ±	1		
	2		
FRACTIONAL ±	3		
	4		
ANGULAR ±	5		
	6		

LAURIER INC.

VAC GAUGE ASSY

DRAWN BY DL	SCALE ~	MATERIAL
CHK'D	DATE 3/17/89	DRAWING NUMBER B9012973
TRACED	APP'D	

11 X 17 PRINTED ON NO. 1000H CLEARPRINT ●

LAURIER

TITLE: KIP VALVE ELEC ASSY

MACHINE:

ML-A9012195

PAGE 1 OF 1

ITEM	QTY.	DWG NO.	DESCRIPTION	MANUFACTURER	REMARKS
1.	1	-2004707	SOLENOID VALVE		
2.	2	-2006052	RING TERMINAL #6		
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
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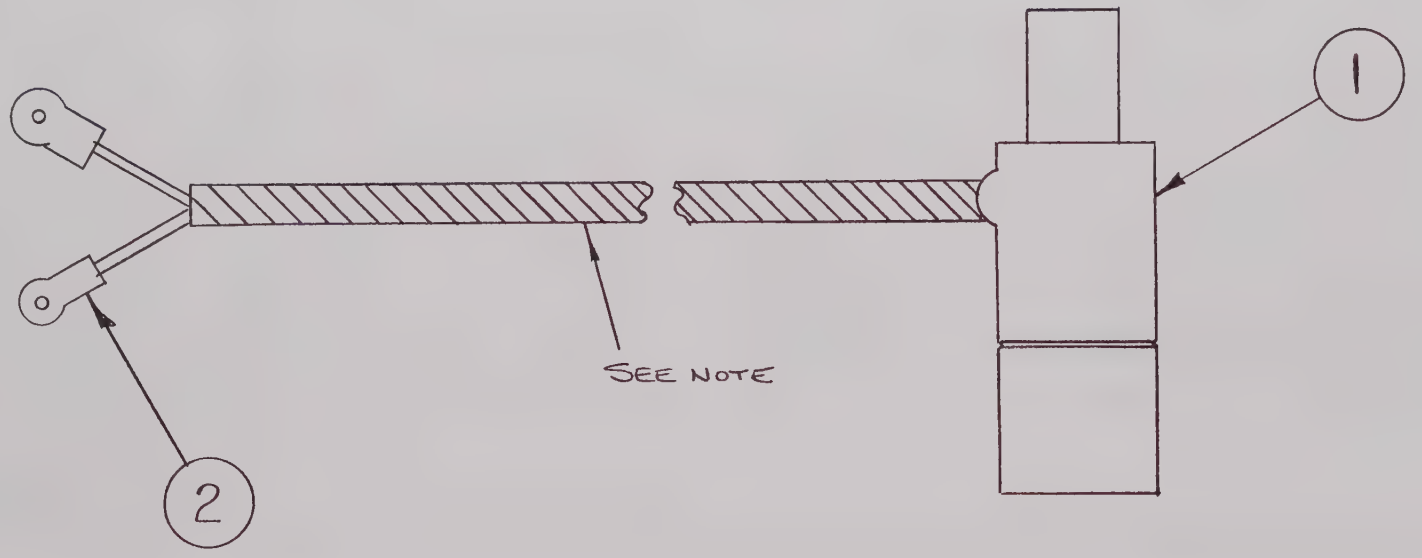

NOTE:

WIRE MUST BE 24 ins. LG.
BEFORE TWISTING.
TWIST WIRES AT LEAST 3 TIMES PER INCH

TOLERANCES (EXCEPT AS NOTED)	REVISIONS		
	NO.	DATE	BY
DECIMAL ±	1		
	2		
FRACTIONAL ±	3		
	4		
ANGULAR ±	5		

LAURIER INC.

KIP VALVE ELEC. Assy

DRAWN BY S.LAFORGE	SCALE ~	MATERIAL
CHK'D	DATE 11-22-88	DRAWING NO. 9012195
TRACED	APP'D	

No. 1066-9X211

Laurier Associates, inc

TITLE: DC HARNESS ASSY

MACHINE:

ML- A9009432

PAGE 1 OF 1

ITEM	QTY.	DWG NO.	DESCRIPTION	MANUFACTURER	REMARKS
1.					
2.	8	-2009401	SOCKET FEMALE		
3.	2	-2009400	4 PIN FEMALE CONNECTOR		P5
4.	2.5	-2000040	WIRE 20 GA RED		
5.	2.5	-2000042	WIRE 20 GA BLACK		
6.	2.5	-2000047	WIRE 20 GA YELLOW		
7.	2.5	-2000050	WIRE 20 GA WHITE		
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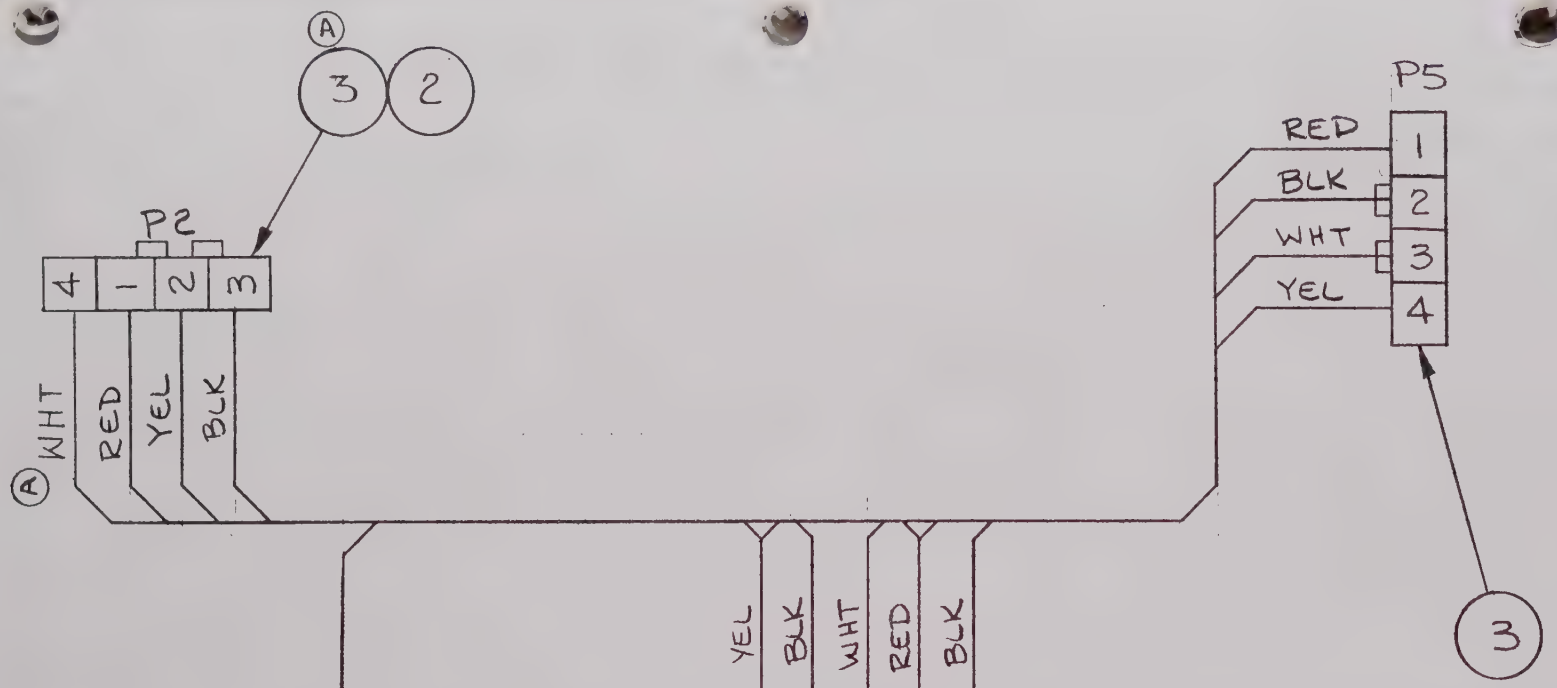

Ⓐ REV-1 ITEM 3 WAS 1, ADDED WHT.

TOLERANCES (EXCEPT AS NOTED)	REVISIONS			LAURIER ASSOCIATES, INC.		
	NO.	DATE	BY			
DECIMAL ±	1	6-2-86	LD	DC HARNESS ASSY		
FRACTIONAL ±	2					
ANGULAR ±	3			DRAWN BY C GIGUERE	SCALE NONE	MATERIAL -
	4			CHK'D	DATE 3-6-86	DRAWING NO. 9009432
	5			TRACED	APP'D	

NATIONAL NO. 1085E-8½X11

Laurier Associates, inc

TITLE: AC HARNESS ASSY

MACHINE:

ML-A9009433

PAGE 1 OF 1

ITEM	QTY.	DWG NO.	DESCRIPTION	MANUFACTURER	REMARKS
1.	.500	-200681388	WIRE 18GA TEFLON GREEN		
2.	.500	-200082889	WIRE 18GA TEFLON BLACK		
3.	.500	-200083088	WIRE 18GA TEFLON WHITE		
4.	2	-200093994	CAPACITOR .01μf 2KV		
5.	1	-200093933	TERMINAL STRIP 5PIN		
6.					
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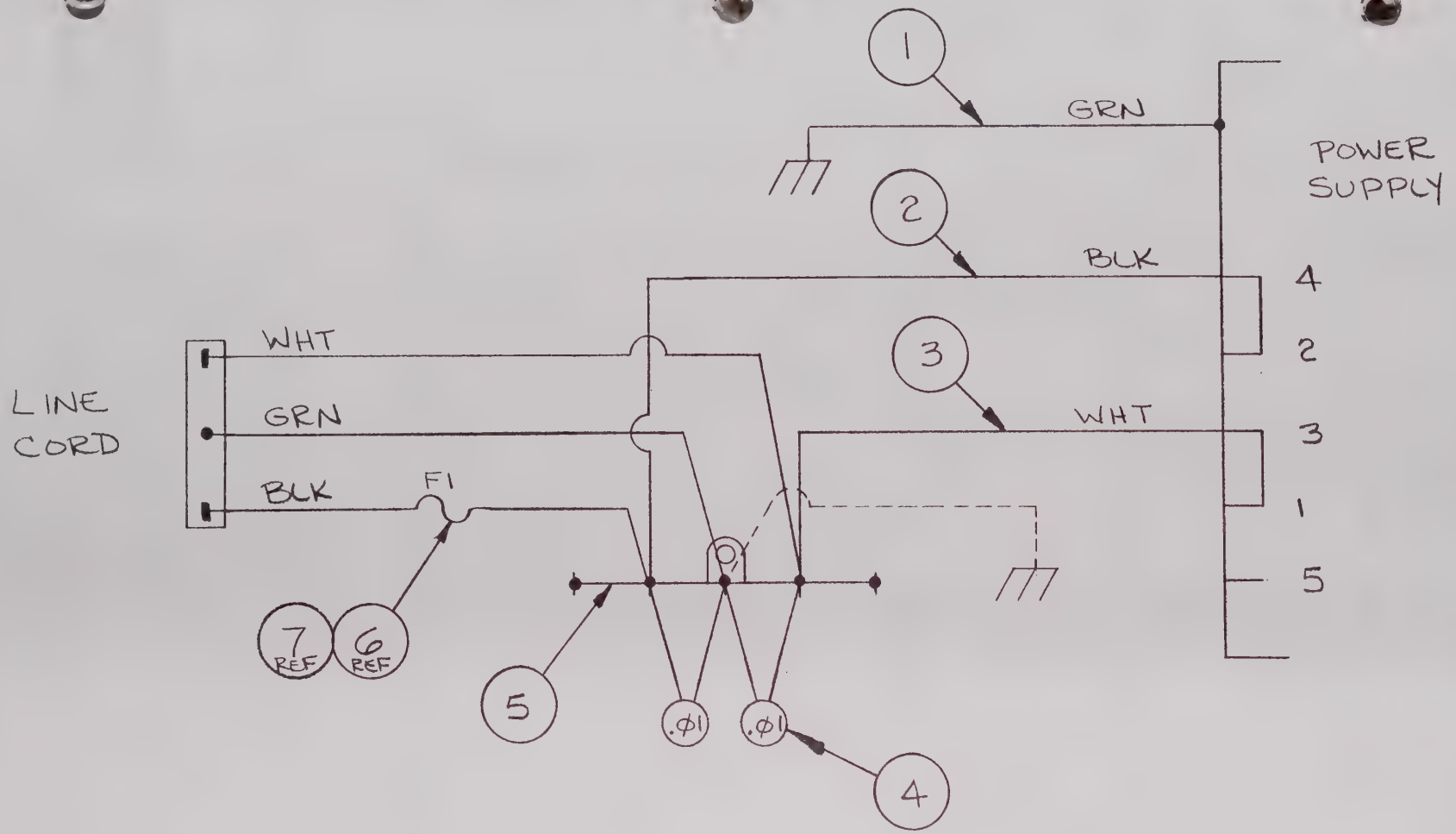
26.					



TOLERANCES (EXCEPT AS NOTED)	REVISIONS		
DECIMAL ±	NO.	DATE	BY
FRACTIONAL ±	1		
ANGULAR ±	2		
	3		
	4		
	5		

LAURIER ASSOCIATES, INC.

AC HARNESS ASSY

DRAWN BY C GIGUERE	SCALE NONE	MATERIAL —
CHK'D	DATE 3-6-86	DRAWING NO. 9009433
TRACED	APP'D	

LAURIER® INCORPORATED

TITLE: MONITOR ASS'Y TTL (VGA)

MACHINE: HA 225 PLUS

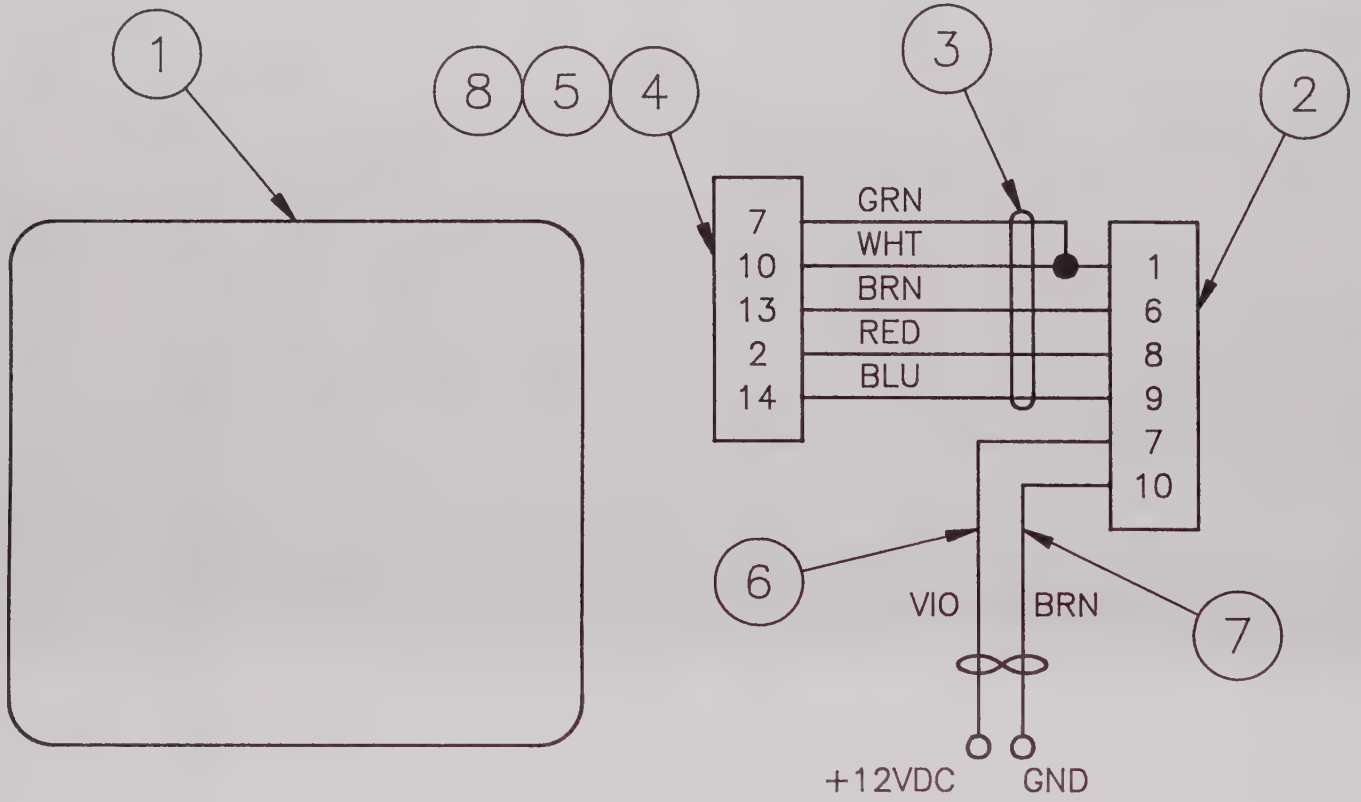
EFFECTIVE : _____

REVISION A: _____
B: _____
C: _____
D: _____

ML-A9018986

PAGE 1 OF 1

ITEM	QTY	DWG. NO.	DESCRIPTION	MANUFACTURER	REMARKS	REV	PURCH. DATA DUE	REQ	ORD
1	1	-201898 1	MONITOR, 9" TTL/VGA	SEE PROD SPEC					
2	1	-201281 0	CONN EDGE 10 POS						
3	4	-200513 6	CABLE 24 AWG 6 COND						
4	1	-201281 1	CONN STR .240 DIA	AMP	745171-1				
5	1	-201900 3	CONN D 15 POS HIGH DENSITY	AMP	748364-1				
6	10	-201119 5	WIRE 18 AWG VIOLET TEFLON						
7	10	-200868 8	WIRE 18 AWG BROWN TEFLON						
8	5	-201900 4	PIN, 22-28 AWG	AMP	748333-7				



TOLERANCES (EXCEPT AS NOTED)	REVISIONS		
	NO.	DATE	BY
DECIMAL .XX = .01 ± .XXX = .005	1		
	2		
FRACTIONAL ± 1/64	3		
	4		
ANGULAR 1° ±	5		
	6		

LAURIER INC.

MONITOR ASS'Y (TTL/VGA)

DRAWN BY	SCALE	MATERIAL
C. GIGUERE	NONE	
CHK'D	DATE 5/26/92	DRAWING NUMBER 9018986
TRACED	APP'D	

8½ X 11 PRINTED ON NO. 1000H CLEARPRINT ●

LAURIER® INCORPORATED

TITLE: OUTPUT CAMERA ASSY

MACHINE: #2282

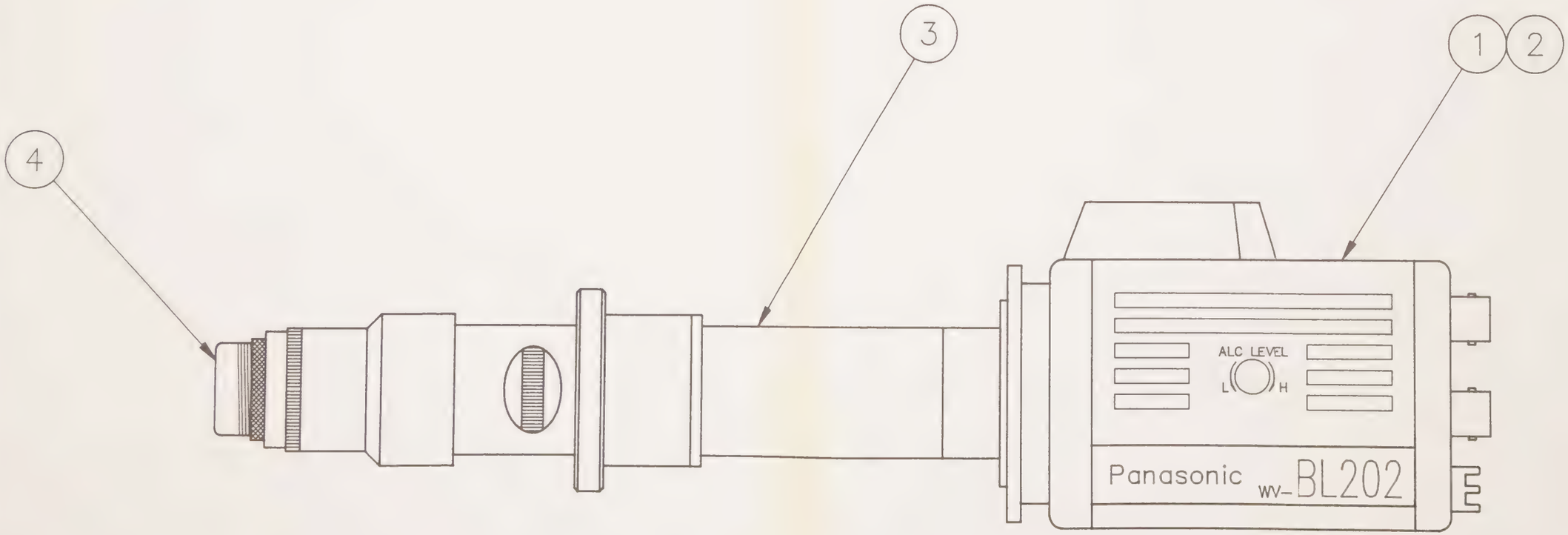
EFFECTIVE :

REVISION A:
B:
C:
D:

ML-89019134

PAGE 1 OF 1

LTR	QTY	DWG. NO.	DESCRIPTION	MANUFACTURER	REMARKS	REV	PURCH. DATA DUE	REQ	ORI
1	1	-20175116	CAMERA 12 VDC						
2	1	-10194755	ZOOM LENS						
3	1	-10095766	LENS .75X						
4	1	-20060511	CABLE VIDEO 6'						



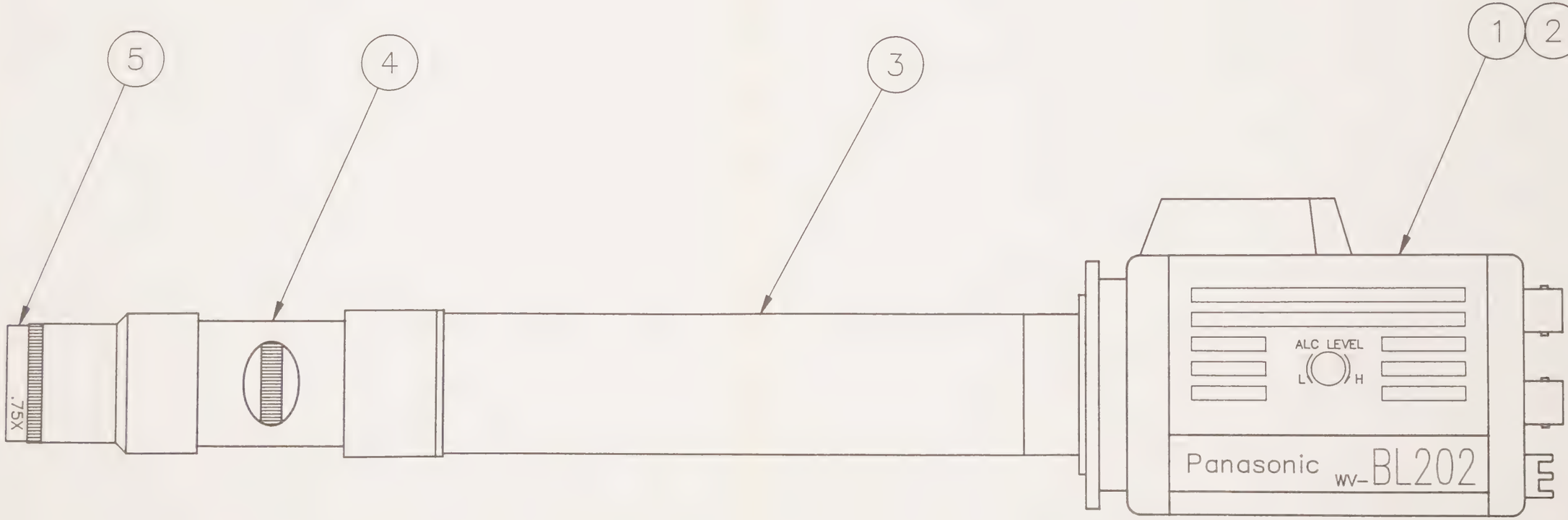
#18 VIO AND BRN TWISTED
TO 12VDC POWER SUPPLY

TOLERANCES (EXCEPT AS NOTED)	REVISIONS		
	NO.	DATE	BY
DECIMAL .X = .1 ±.XX = .01 .XXX = .005	1		
	2		
FRACTIONAL ± 1/64	3		
	4		
ANGULAR ± 1°	5		
	6		

LAURIER INC.

CAMERA ASS'Y

DRAWN BY	SCALE	MATERIAL
C. GIGUERE	FULL	–
CHK'D	DATE 7/10/92	DRAWING NUMBER
TRACED	APP'D	9019134



#18 VIO AND BRN TWISTED
TO 12VDC POWER SUPPLY

TOLERANCES (EXCEPT AS NOTED)	REVISIONS		
DECIMAL .X = .1 ±.XX = .01 .XXX = .005	NO.	DATE	BY
	1		
	2		
FRACTIONAL ± 1/64	3		
	4		
ANGULAR ± 1°	5		
	6		

LAURIER INC.

CAMERA ASS'Y

DRAWN BY	SCALE	MATERIAL
C. GIGUERE	FULL	–
CHK'D	DATE 6/18/92	DRAWING NUMBER
TRACED	APP'D	9018871

LAURIER® INCORPORATED

TITLE: Y-ARM ASSEMBLY

MACHINE: # 2282

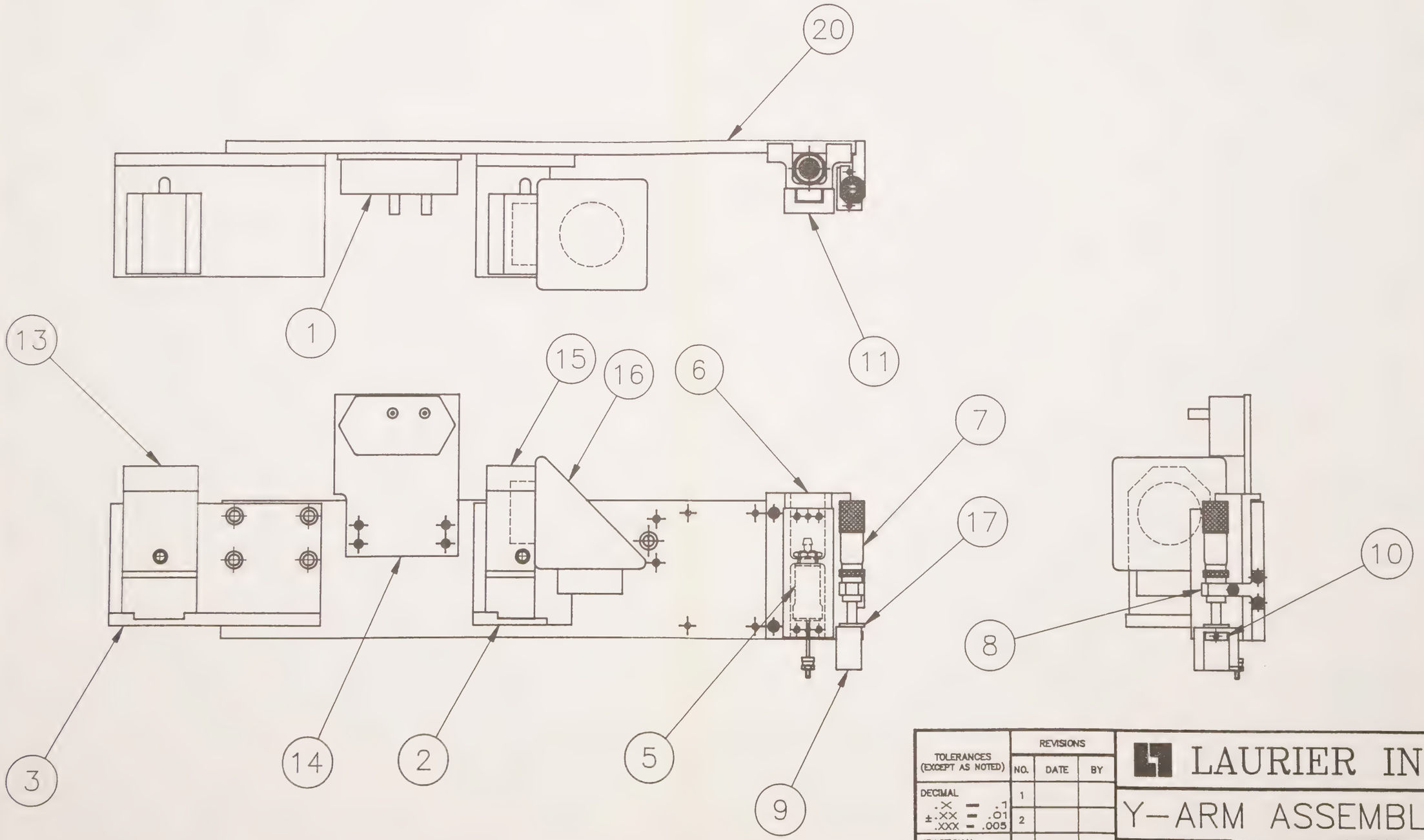
EFFECTIVE : _____

REVISION A: _____
B: _____
C: _____
D: _____

ML-B9019133

PAGE 1 OF 1

ITEM	QTY	DWG. NO.	DESCRIPTION	MANUFACTURER	REMARKS	REV	PURCH. DATA DUE	REQ	ORD
1	1	A901297 3	VACUUM GAUGE ASS'Y						
2	1	B801652 1	ANGLE, SUPPORT		PRISM				
3	1	B801952 8	ANGLE, CAMERA SUPPORT						
4									
5	1	-10086 52	ACTUATOR						
6	1	B801265 2	BRACKET, ACTUATOR						
7	1	-10130 77	MICROMETER						
8	1	A801274 7	CLAMP, MICROMETER						
9	1	A801263 4	Z STOP						
10	1	A801264 8	COLLAR						
11	1	-10130 39	BALL SLIDE						
12									
13	1	B801259 3	CLAMP, PRISM						
14	1	A801649 7	PLATE, VACUUM DETECT						
15	1	B801652 3	CLAMP, PRISM NARROW						
16	1	A301652 4	PRISM REWORK						
17	1	A801264 7	WASHER						
18									
19									
20	1	C801265 4	PLATE Y-ARM						



TOLERANCES (EXCEPT AS NOTED)	REVISIONS		
	NO.	DATE	BY
DECIMAL .X = .1 ±.XX = .01 .XXX = .005	1		
	2		
FRACTIONAL ± 1/64	3		
	4		
ANGULAR ± 1°	5		
	6		

LAURIER INC.

Y–ARM ASSEMBLY

DRAWN BY	SCALE	MATERIAL
C. GIGUERE	1/2	
CHK'D	DATE 7/10/92	DRAWING NUMBER 9019133
TRACED	APP'D	

LAURIER® INCORPORATED

TITLE: LINEAR OUTPUT STATION

MACHINE: HA225 PLUS

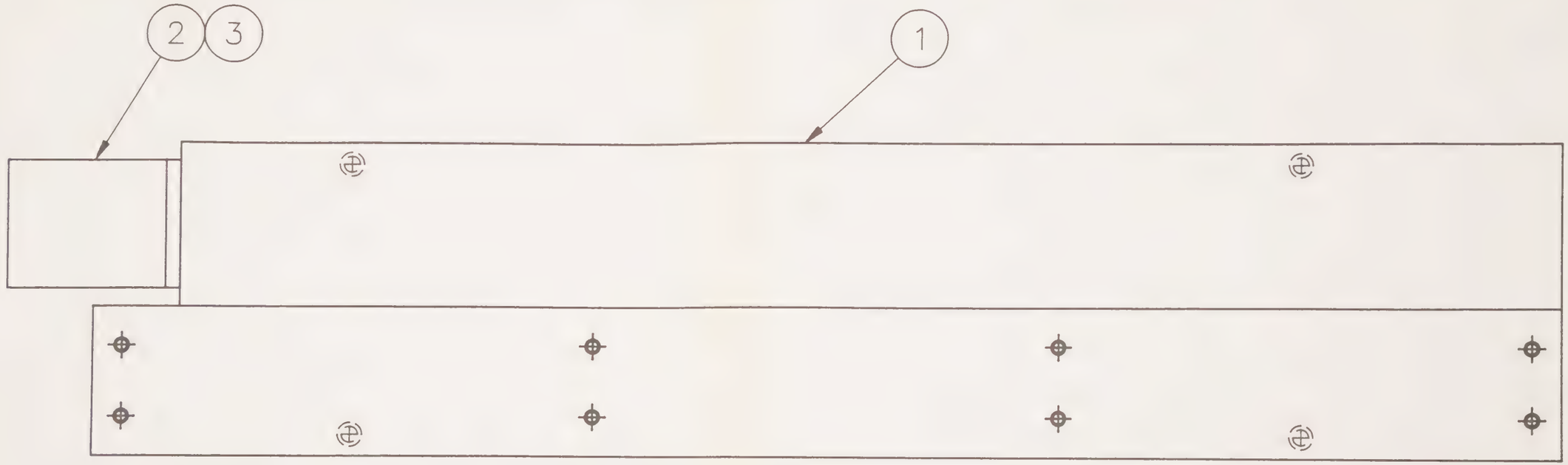
EFFECTIVE : _____

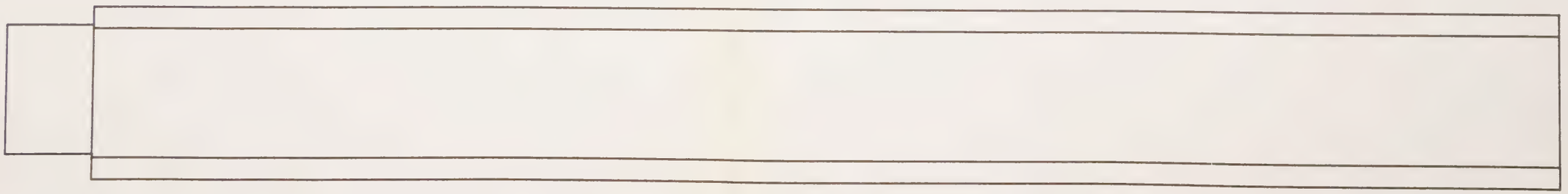
REVISION A: _____
B: _____
C: _____
D: _____

ML-B9018885

PAGE 1 OF 1

LTR LN	QTY	DWG. NO.	DESCRIPTION	MANUFACTURER	REMARKS	REV	PURCH. DATA DUE	REQ	ORD
1	1	-101439 1	TABLE 18" TRAVEL	SEE PROD SPEC	Y				
2	1	A9005061	STEPPER MOTOR ASSY						
3	1	A9015628	LIMITS TO CONTROLLER CABLE						
4									



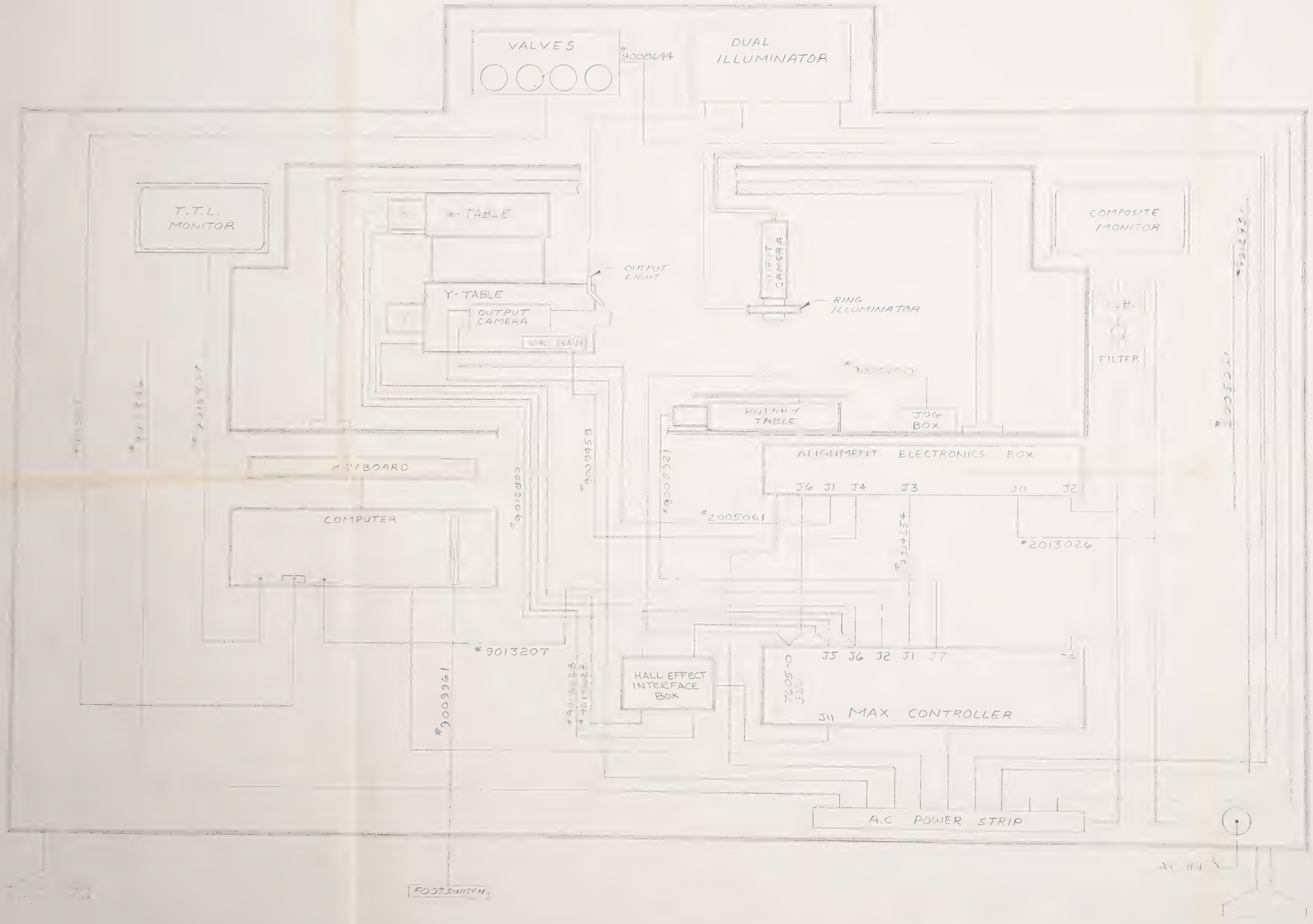


TOLERANCES (EXCEPT AS NOTED)	REVISIONS		
	NO.	DATE	BY
DECIMAL .X = .1 ±.XX = .01 .XXX = .005	1		
	2		
FRACTIONAL ± 1/64	3		
	4		
ANGULAR ± 1°	5		
	6		

LAURIER INC.

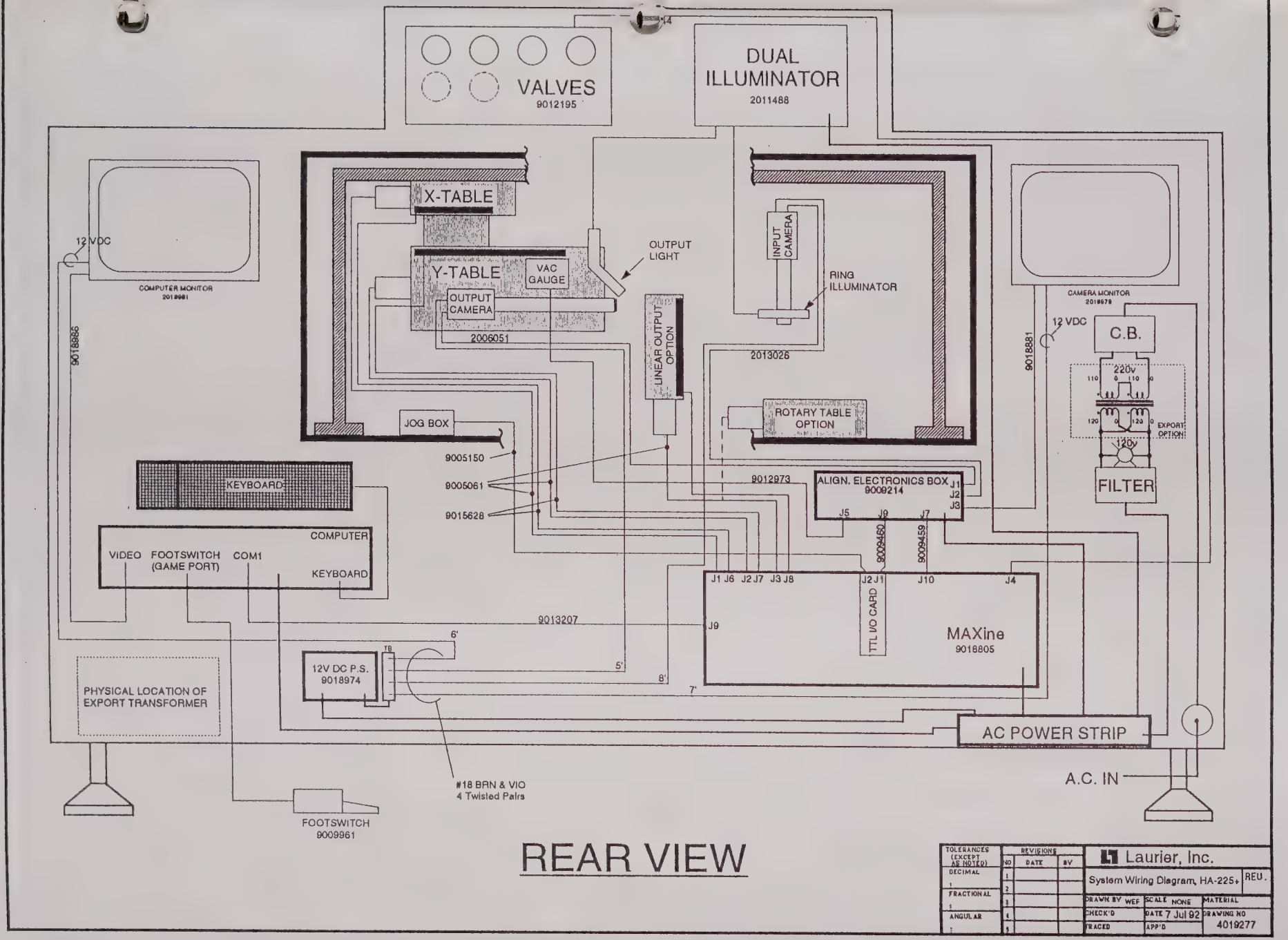
LINEAR OUTPUT STATION

DRAWN BY	SCALE	MATERIAL
C. GIGUERE	1/2	–
CHK'D	DATE 6/19/92	DRAWING NUMBER 9018885
TRACED	APP'D	



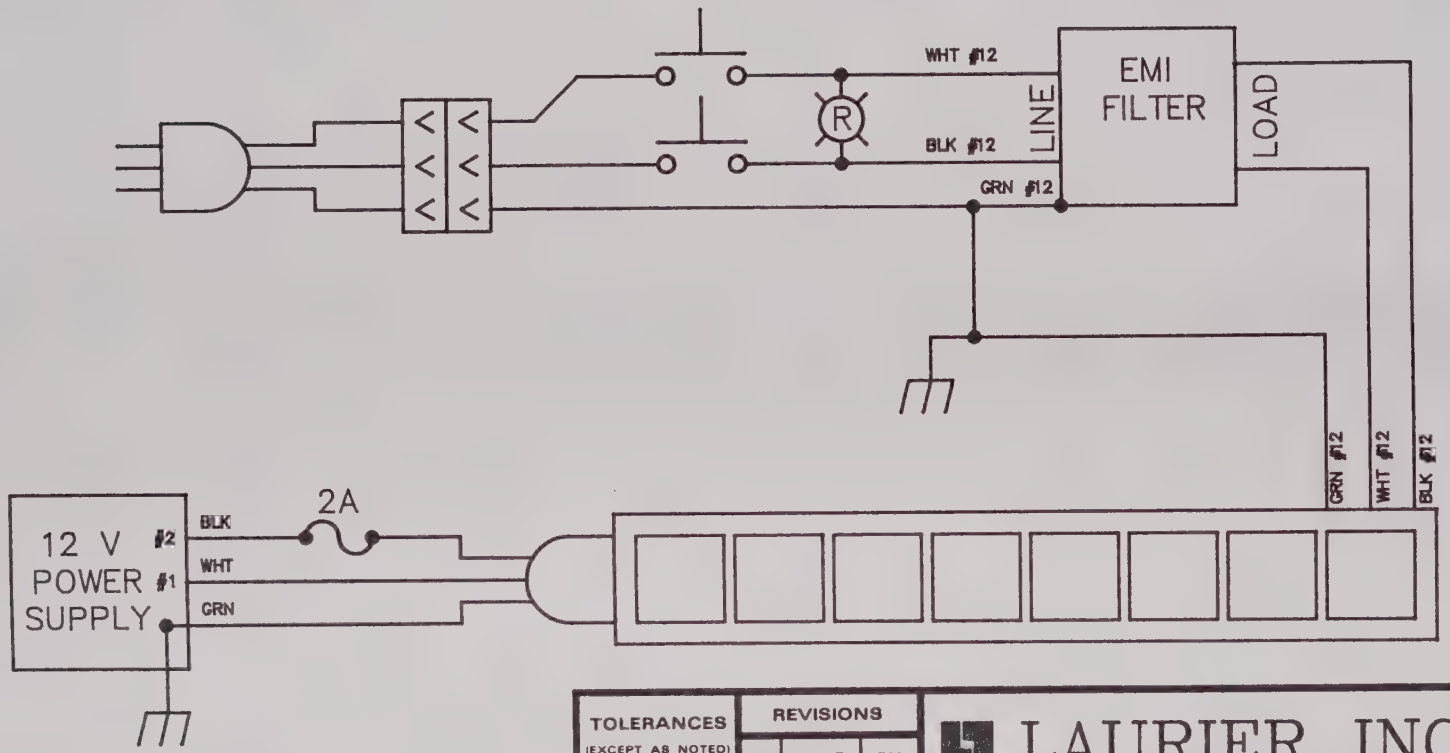
REAR VIEW

TOLERANCES (EXCEPT AS NOTED)	REVISIONS: NO	DATE	BY	LAURIER INC.
DECIMAL				SYSTEM DIAGRAM
FRACTIONAL	DRAWN BY C.SIGUERE	SCALE ~	MATERIAL	
ANGULAR	CHK'D	DATE 6-22-89	DRAWING NO MLS-640	
	TRACED	APP'D		



REAR VIEW

TOLERANCES (EXCEPT AS NOTED)	REVISIONS			Laurier, Inc.	
DECIMAL	NO	DATE	BY	System Wiring Diagram, HA-225+	REV.
FRACTIONAL				DRAWN BY WEF / SCALE NONE / MATERIAL	
ANGULAR				CHECK'D / DATE 7 Jul 92 / DRAWING NO 4019277	
				TRACED / APP'D	



NOTE

ALL WIRE IS 12 AWG POWER SUPPLY CORD IS 24" LONG, LEFT OVER FROM POWER STRIP

TOLERANCES (EXCEPT AS NOTED)	REVISIONS		
	NO.	DATE	BY
DECIMAL .XX = .01 ± .XXX = .005	1		
	2		
FRACTIONAL ± 1/64	3		
	4		
ANGULAR ± 1°	5		
	6		

LAURIER INC.

MAIN POWER WIRING DIAGRAM

DRAWN BY	SCALE	MATERIAL
C. GIGUERE	—	—
CHK'D	DATE 11/13/89	DRAWING NUMBER 4015994
TRACED	APP'D	

8½ X 11 PRINTED ON NO. 1000H CLEARPRINT ●

LAURIER® INCORPORATED

TITLE: EPOXY DISPENSE KIT

MACHINE: HA-225 PLUS

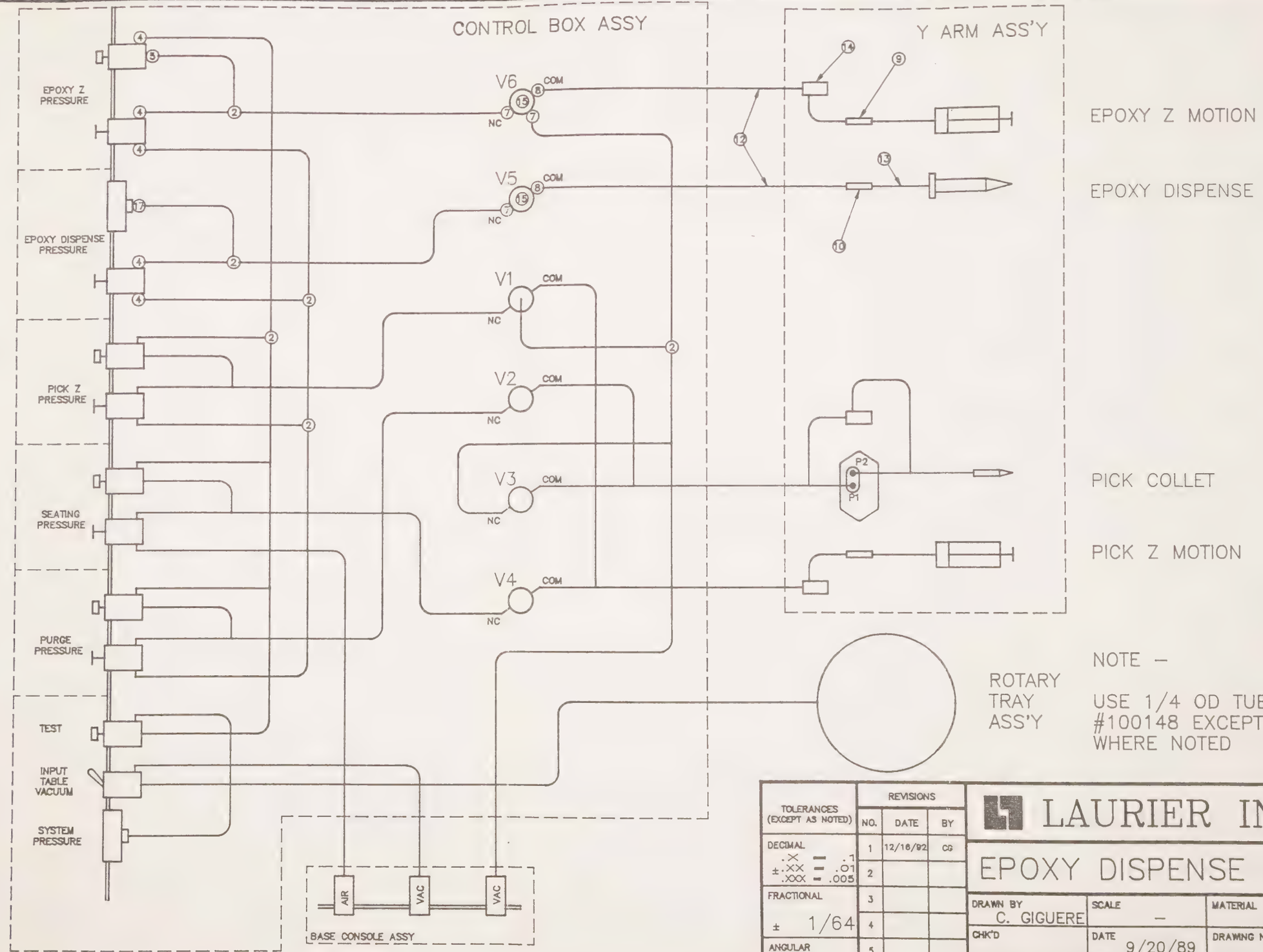
EFFECTIVE : _____

REVISION A: _____
B: _____
C: _____
D: _____

ML-B9015874

PAGE 1 OF 1

ITEM	QTY	DWG. NO.	DESCRIPTION	MANUFACTURER	REMARKS	REV	PURCH. DATA DUE	REQ	ORD
1	2	-100587 2	REGULATOR						
2	6	-100134 3	TEE, 1/4 TUBE						
3	1	-100940 9	VALVE						
4	5	-100732 6	FITTING, 90° 1/4 TUBE x 10-32						
5	1	-100001 78	FITTING STRAIGHT						
6	1	-100001 00	PUSH BUTTON, VALVE						
7	3	-100001 83	FITTING, 90° 1/4 TUBE x 1/8 NPT						
8	2	-101304 9	FITTING, 90° 5/32 TUBE x 1/8 NPT						
9	1	-100411 1	REDUCER						
10	1	-101305 0	COUPLER .078 TUBE						
11	10'	-100001 48	TUBING, 1/4 OD						
12	10'	-100000 19	TUBING, 5/32 OD						
13	4"	-100158 4	TUBING, SURGICAL						
14	1	-100925 9	VARIABLE RESTRICTOR						
15	2	A90121 95	VALVE ASSY						
16	1	B90129 93	EPOXY DISPENSE ASSY						
17	1	-100001 82	FITTING 1/8 NPTF - 1/4 OD TUBE						
18	1	-101242 4	PRESSURE GAUGE 0-60 PSI						
19									



NOTE –

USE 1/4 OD TUBING #100148 EXCEPT WHERE NOTED

① REDRAWN AND ADDED GAGE FOR EPOXY DISPENSE

REF B9015868 FOR MAIN PLUMBING DIAGRAM

TOLERANCES (EXCEPT AS NOTED)	REVISIONS		
	NO.	DATE	BY
DECIMAL .X = .1, ±.XX = .01, .XXX = .005	1	12/16/92	CG
	2		
FRACTIONAL ± 1/64	3		
	4		
ANGULAR ± 1°	5		
	6		

LAURIER INC.

EPOXY DISPENSE KIT

DRAWN BY	SCALE	MATERIAL
C. GIGUERE	–	–
CHK'D	DATE 9/20/89	DRAWING NUMBER
TRACED	APP'D	9015874

LAURIER® INCORPORATED

TITLE: SOLENOID VALVE TO MAX CABLE

MACHINE:

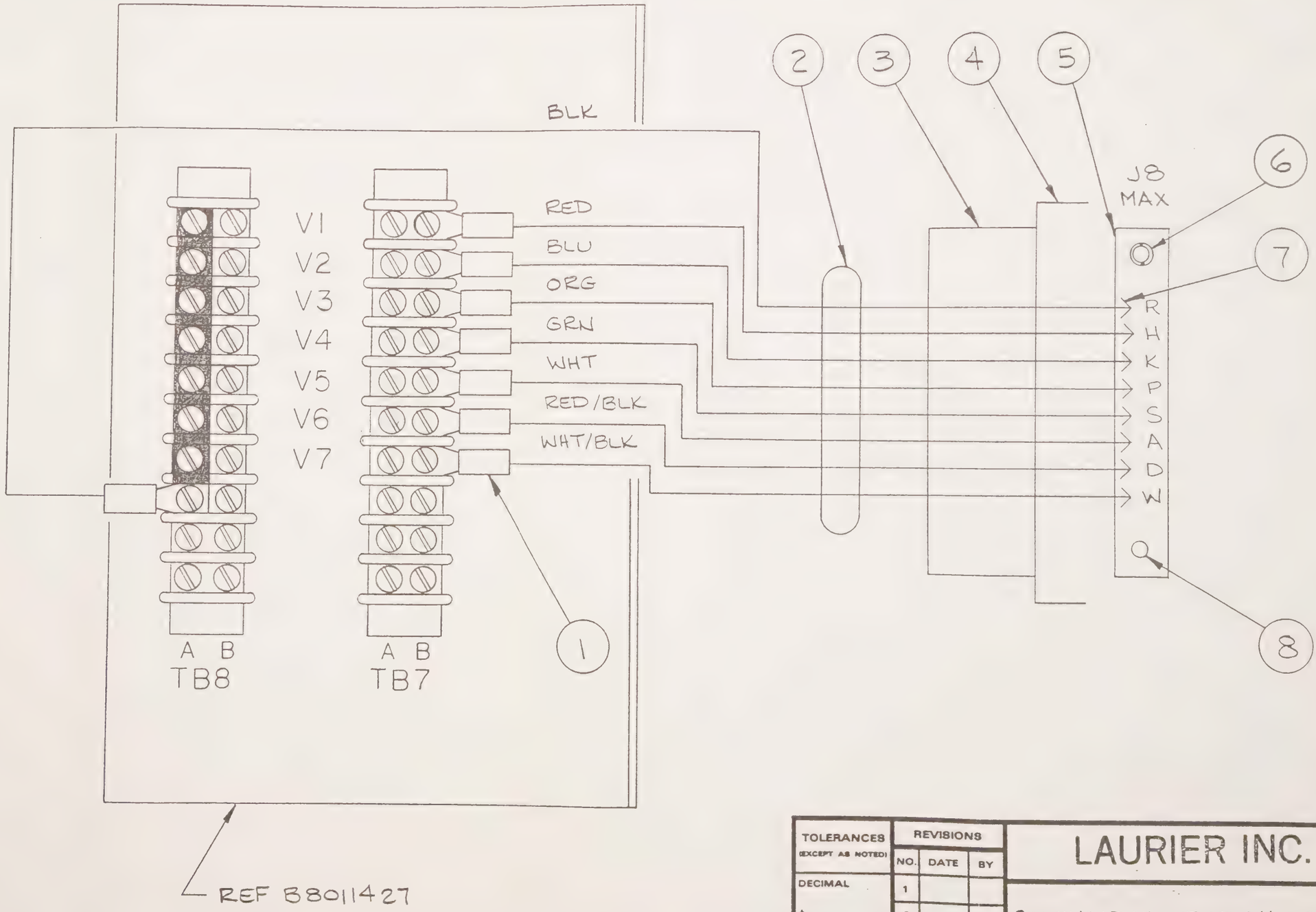
EFFECTIVE : _____

REVISION A: _____
B: _____
C: _____
D: _____

ML-B9015867

PAGE 1 OF 1

ITEM	QTY	DWG. NO.	DESCRIPTION	MANUFACTURER	REMARKS	REV	PURCH. DATA DUE	REQ	ORD
1	8	-200605 2	#6 RING TERMINAL						
2	12'	-201133 4	CABLE - 8 COND						
3	1	-200772 7	SHELL						
4	1	-200772 8	SPRING LOCK						
5	1	-200772 9	CONNECTOR						
6	1	-200773 0	FEMALE GUIDE PIN						
7	8	-200482 6	PIN, MALE						
8	1	-200773 1	MALE GUIDE PIN						



TOLERANCES (EXCEPT AS NOTED)	REVISIONS		
	NO.	DATE	BY
DECIMAL ±	1		
	2		
FRACTIONAL ±	3		
	4		
ANGULAR ±	5		
	6		

LAURIER INC.

SOLENOID VALVE TO MAX CABLE

DRAWN BY C GIGUERE	SCALE —	MATERIAL —
CHK'D	DATE 9-19-89	DRAWING NUMBER 9015867
TRACED	APP'D	

11 X 17 PRINTED ON NO. 1000H CLEARPRINT ●

LAURIER® INCORPORATED

TITLE: CONTROL BOX ASS'Y

MACHINE: HA 225 PLUS

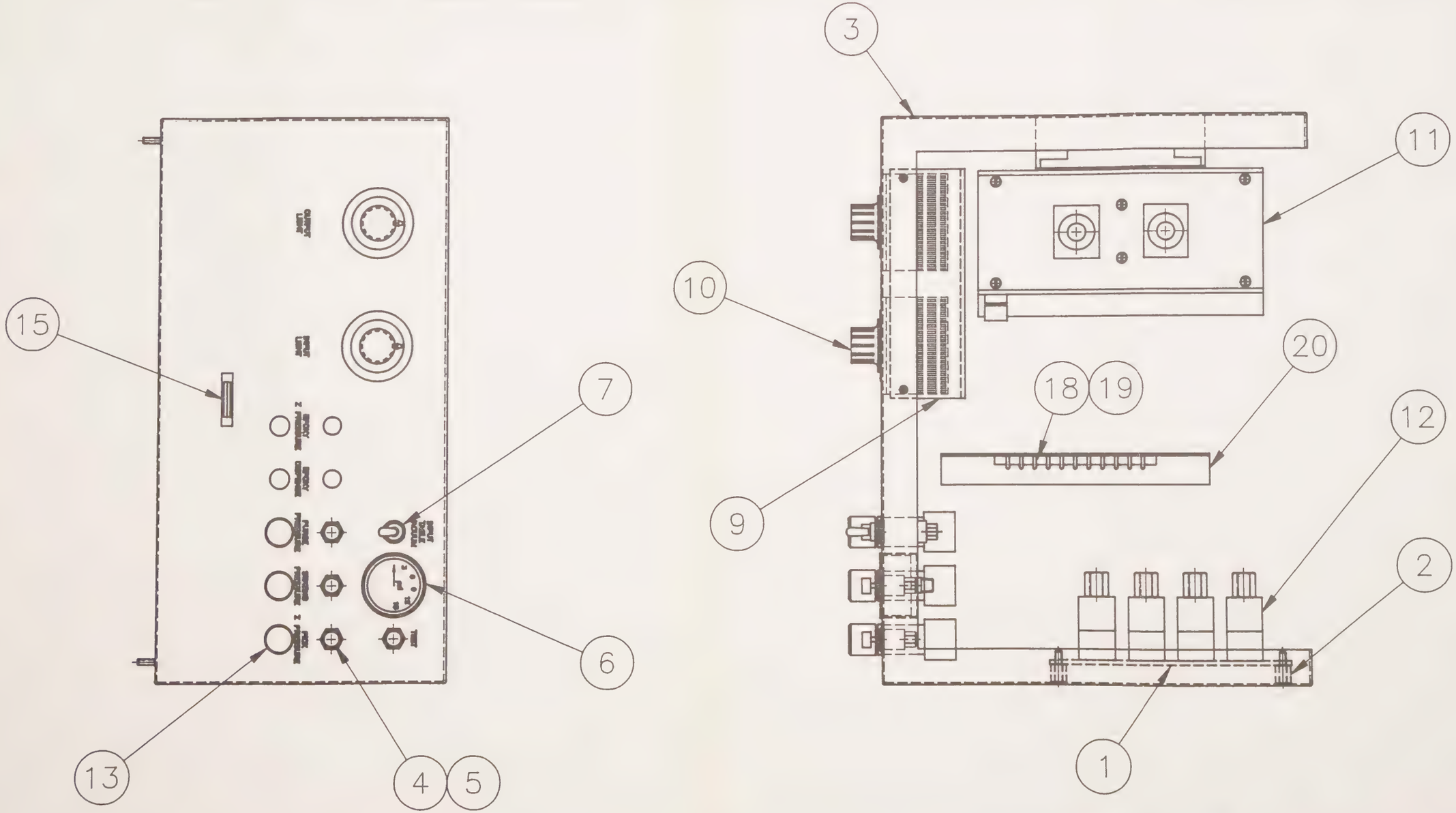
EFFECTIVE : _____

REVISION A: _____
B: _____
C: _____
D: _____

ML-B9018883

PAGE 1 OF 1

ITEM	QTY	DWG. NO.	DESCRIPTION	MANUFACTURER	REMARKS	REV	PURCH. DATA DUE	REQ	ORD
1	1	B801304 3	VALVE PLATE						
2	4	-101140 3	STANDOFF						
3	1	D801144 9	CONTROL BOX						
4	4	-1000100	PUSH BUTTON, VALVE						
5	4	-1009409	VALVE						
6	1	-1005111	GAUGE, PRESSURE						
7	1	-1005948	SWITCH						
8									
9	1	B801287 1	SHIELD						
10	2	A9012000	VARIABLE TRANSFORMER ASS'Y						
11	1	-2011488	DUAL ILLUMINATOR						
12	4	A9012195	VALVE ASS'Y		V1-4				
13	3	-1005872	REGULATOR						
14	1	B9018884	VALVE TO CONTROLLER CABLE						
15	1	-1012111	LATCH, MAGNETIC						
16	1	B9015868	PLUMBING ASS'Y						
17									
18	2	-2004341	TERMINAL STRIP - 10 POS						
19	8	-2000038	TERMINAL STRIP JUMPER						
20	1	B801618 0	BRACKET, TERMINAL STRIP						



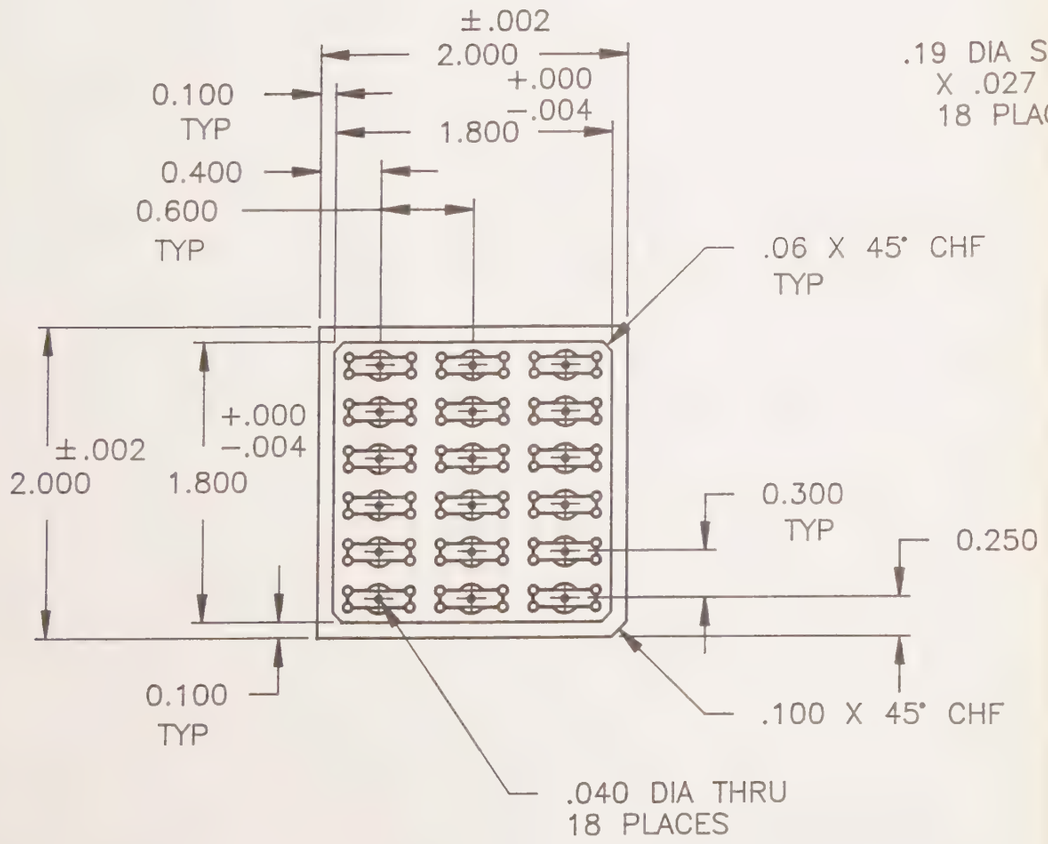
REF B9018884 SOLENOID VALVE TO CONTROLLER WIRING DIAGRAM
REF B9015868 FOR PLUMBING ASS'Y
REF A4014709 LIGHT SOURCE WIRING DIAGRAM

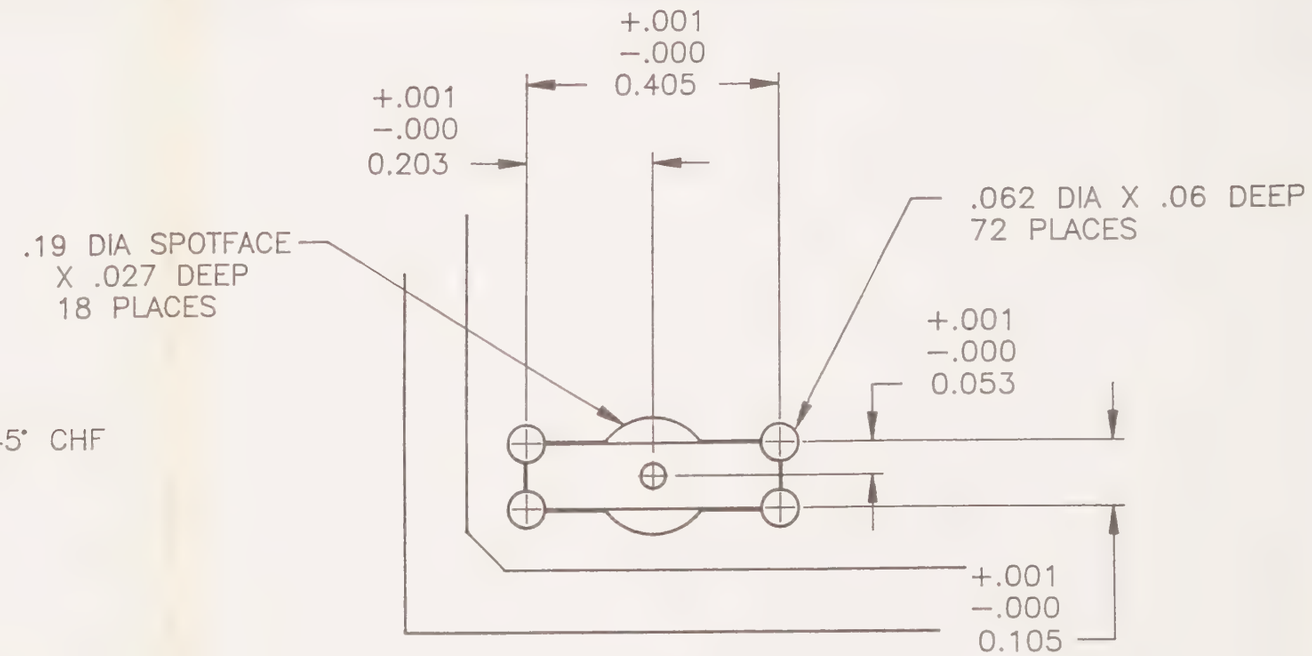
TOLERANCES (EXCEPT AS NOTED)	REVISIONS		
DECIMAL .X = .1, ±.XX = .01, .XXX = .005	NO.	DATE	BY
	1		
	2		
FRACTIONAL ± 1/64	3		
	4		
ANGULAR ± 1°	5		
	6		

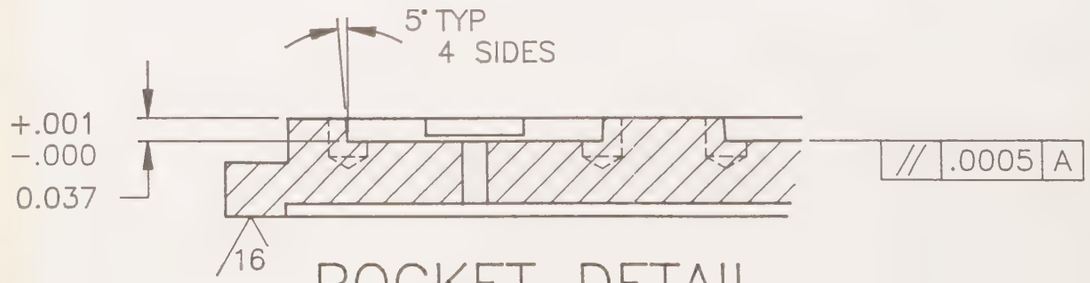
LAURIER INC.

CONTROL BOX ASS'Y

DRAWN BY	SCALE	MATERIAL
C. GIGUERE	1/3	
CHK'D	DATE 6/5/92	DRAWING NUMBER 9018883
TRACED	APP'D	

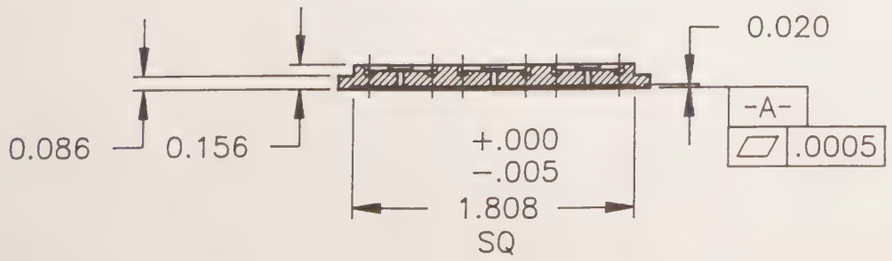






POCKET DETAIL

SCALE: 4X



NOTES

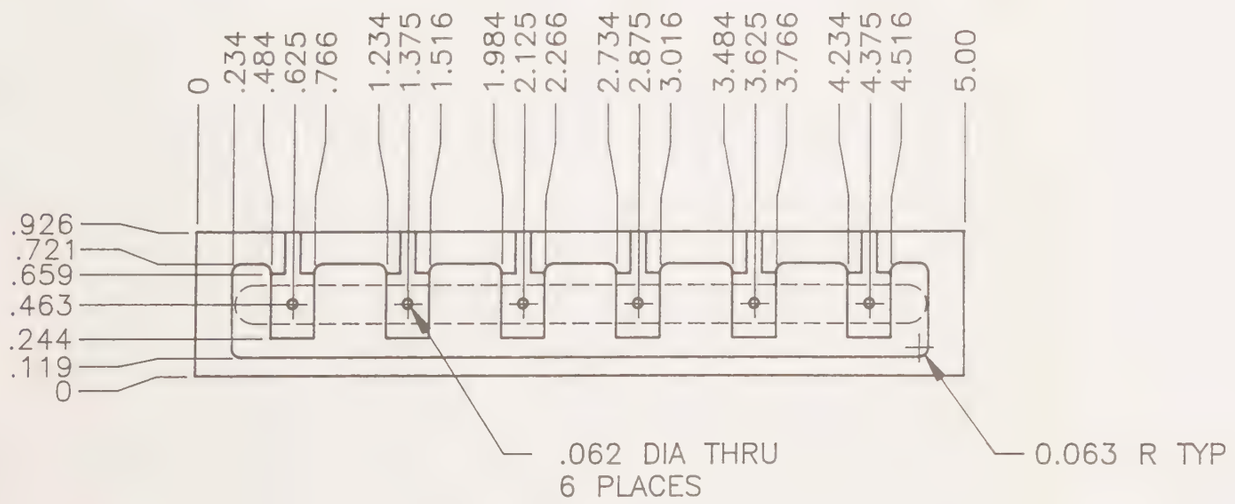
1. FINISH – CONTINUOUS ELECTROLESS NICKEL ABLE TO WITHSTAND HEAT TO 150° C WITHOUT BLISTERING OR PEELING .0003–.0005 THICK

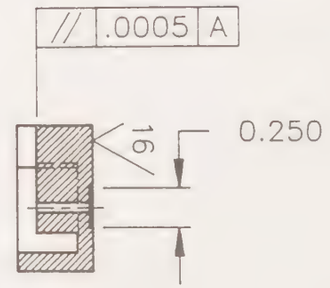
TOLERANCES (EXCEPT AS NOTED)	REVISIONS		
DECIMAL .X = .1, ±.XX = .01, .XXX = .005	NO.	DATE	BY
FRACTIONAL ± 1/64	1		
ANGULAR ± 1°	2		
	3		
	4		
	5		
	6		

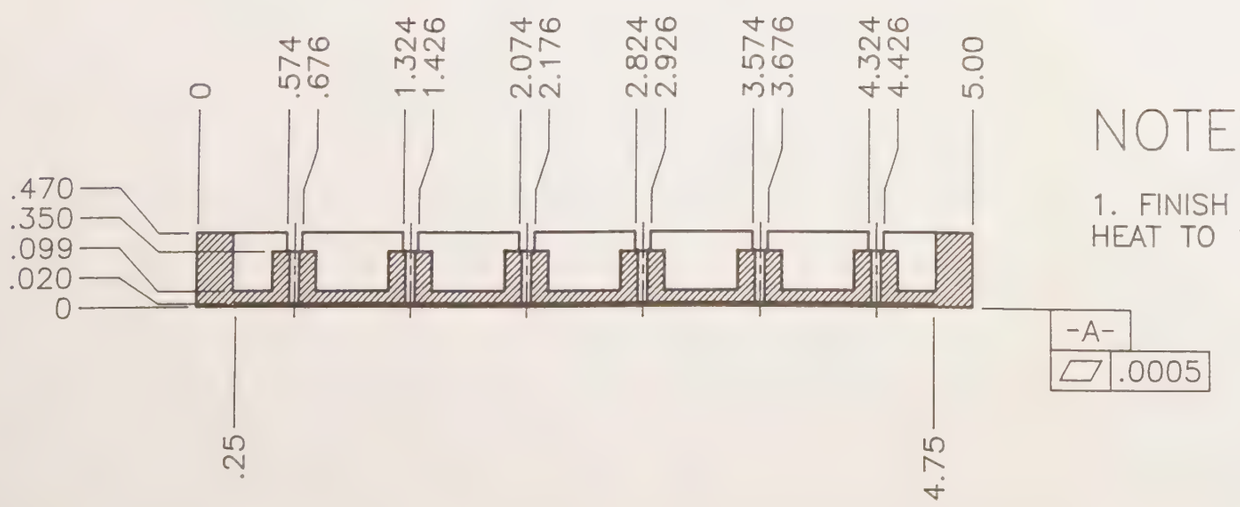
LAURIER INC.

FIXTURE, .100 X .400

DRAWN BY	SCALE	MATERIAL
C. GIGUERE	FULL	6061 ALUM
CHK'D	DATE 12/15/92	DRAWING NUMBER 8019434
TRACED	APP'D	







NOTES

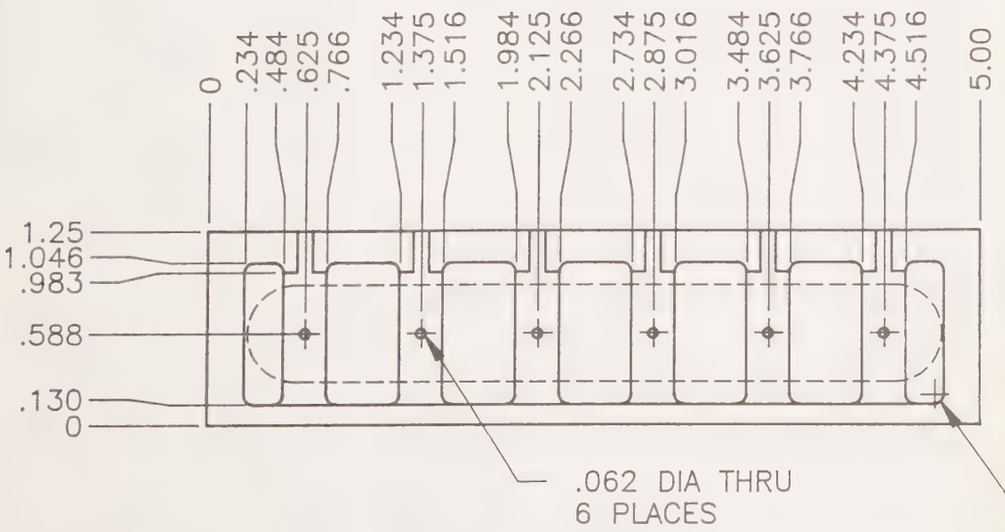
1. FINISH – CONTINUOUS ELECTROLESS NICKEL ABLE TO WITHSTAND HEAT TO 150° C WITHOUT BLISTERING OR PEELING .0003–.0005 THICK

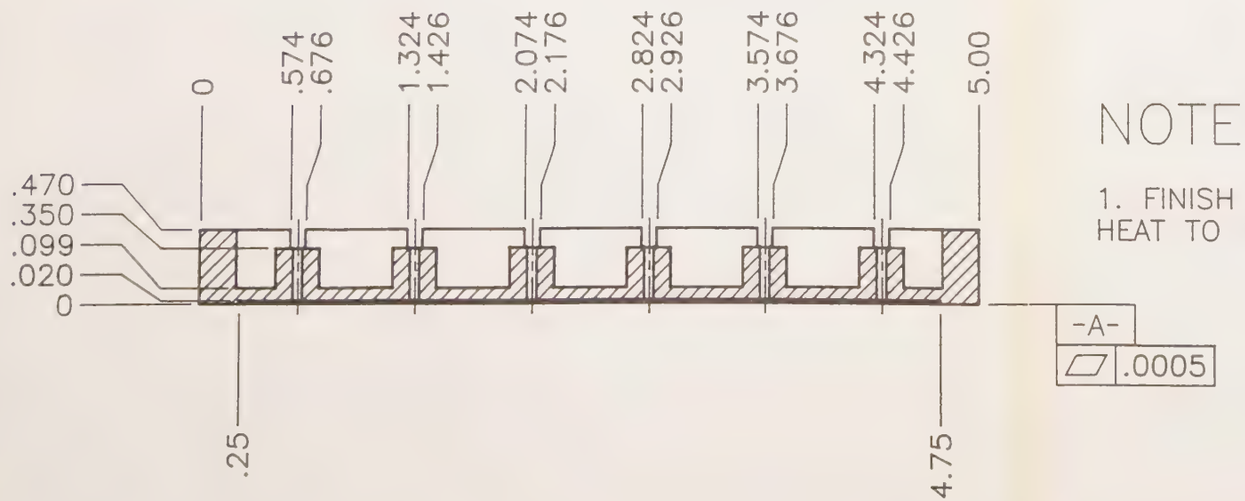
TOLERANCES (EXCEPT AS NOTED)	REVISIONS		
	NO.	DATE	BY
DECIMAL .X = .1 ±.XX = .01 .XXX = .005	1		
	2		
FRACTIONAL ± 1/64	3		
	4		
ANGULAR ± 1°	5		
	6		

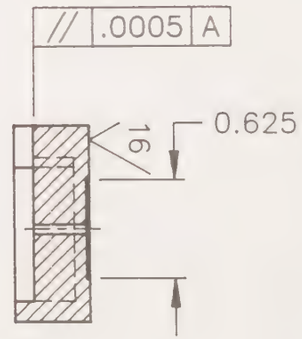
LAURIER INC.

FIXTURE, 3 & 8 PIN PACKAGE

DRAWN BY: C. GIGUERE	SCALE: FULL	MATERIAL: 6061 ALUM
CHK'D	DATE: 12/15/92	DRAWING NUMBER: 8019435
TRACED	APP'D	







NOTES

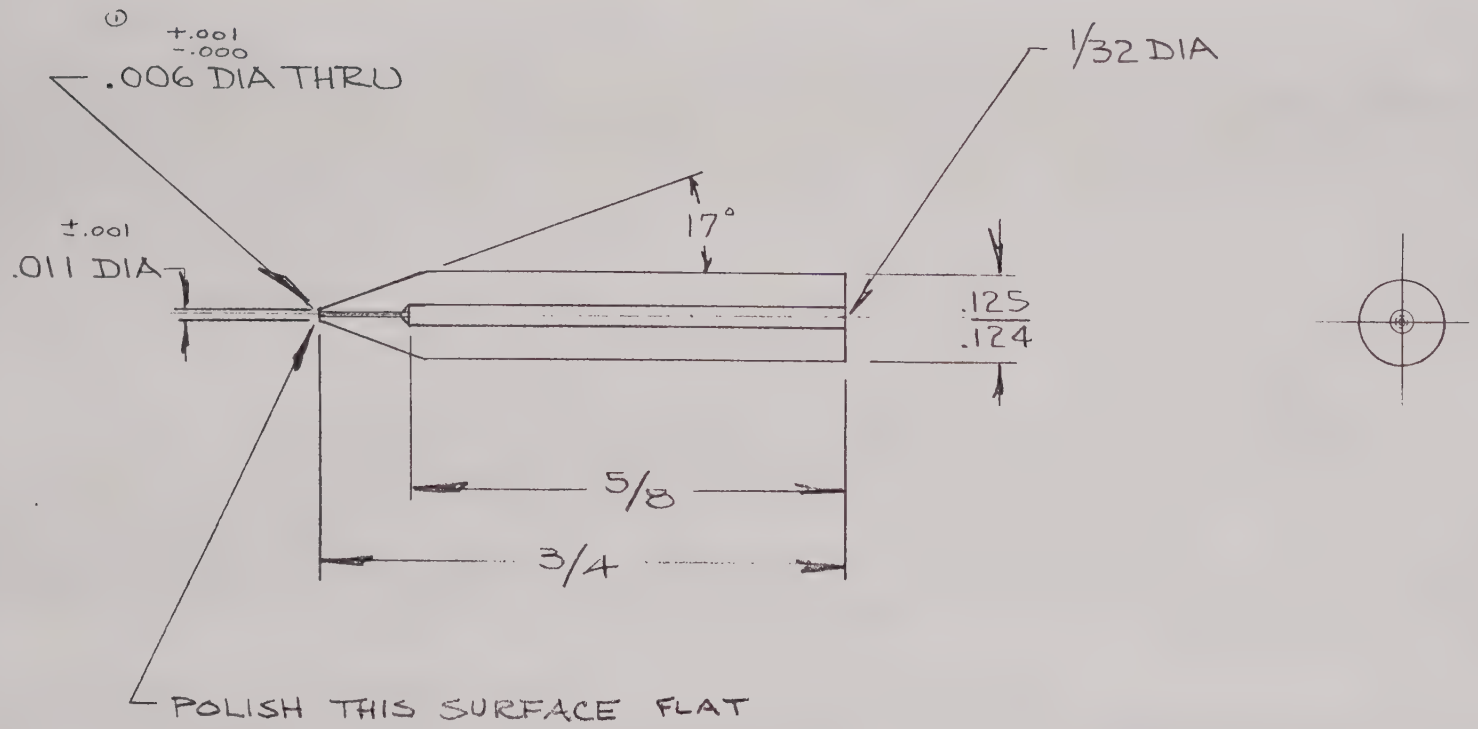
1. FINISH – CONTINUOUS ELECTROLESS NICKEL ABLE TO WITHSTAND HEAT TO 150° C WITHOUT BLISTERING OR PEELING .0003–.0005 THICK

TOLERANCES (EXCEPT AS NOTED)	REVISIONS		
DECIMAL .X = .1 ±.XX = .01 .XXX = .005	NO.	DATE	BY
	1		
	2		
FRACTIONAL ± 1/64	3		
	4		
ANGULAR ± 1°	5		
	6		

LAURIER INC.

FIXTURE, 16 PIN PACKAGE

DRAWN BY C. GIGUERE	SCALE FULL	MATERIAL 6061 ALUM
CHK'D	DATE 12/15/92	DRAWING NUMBER 8019559
TRACED	APP'D	



NOTE: .006 DIA TO BE CONCENTRIC TO .125 DIA. WITHIN .001

① MAT'L: DELRIN 500, WHITE

REVISIONS		
NO.	DATE	BY
1	6-6-88	SL
2		
3		
4		
5		

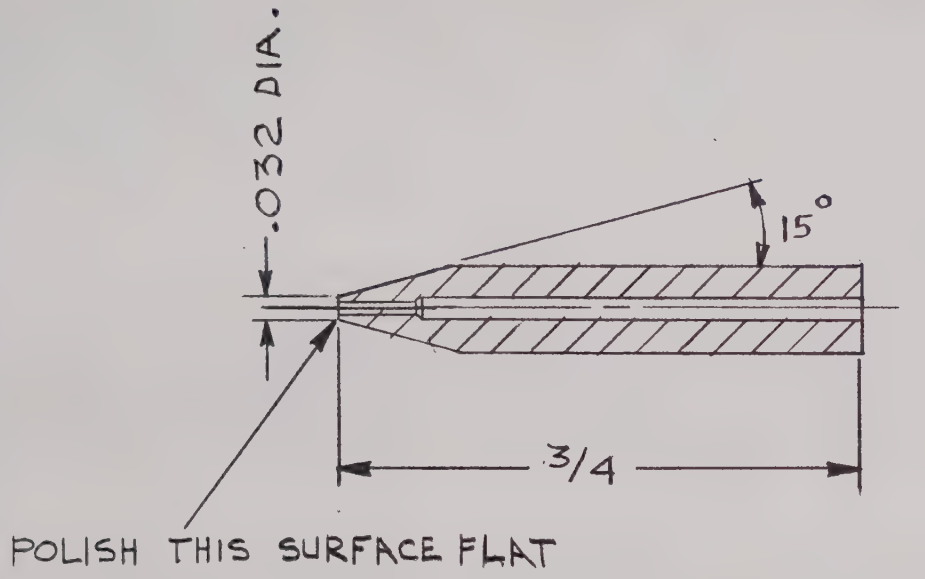
L.A.

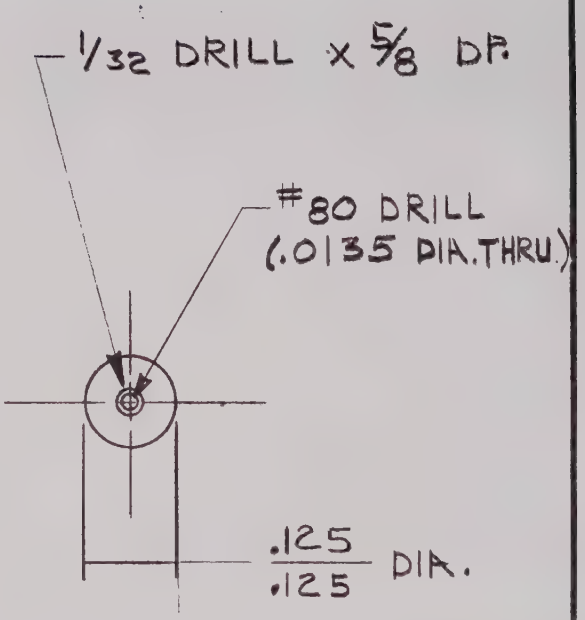
TIP DIE ARM .011 DIA

DRAWN BY KC tt	SCALE 4:1	MATERIAL SEE ABOVE ①
CHK'D	DATE 5/8/75	DRAWING NO. 800 0254 ①
TRACED	APP'D	

USED ON PL 990-1238

NATIONAL NO. 185E-8½X11





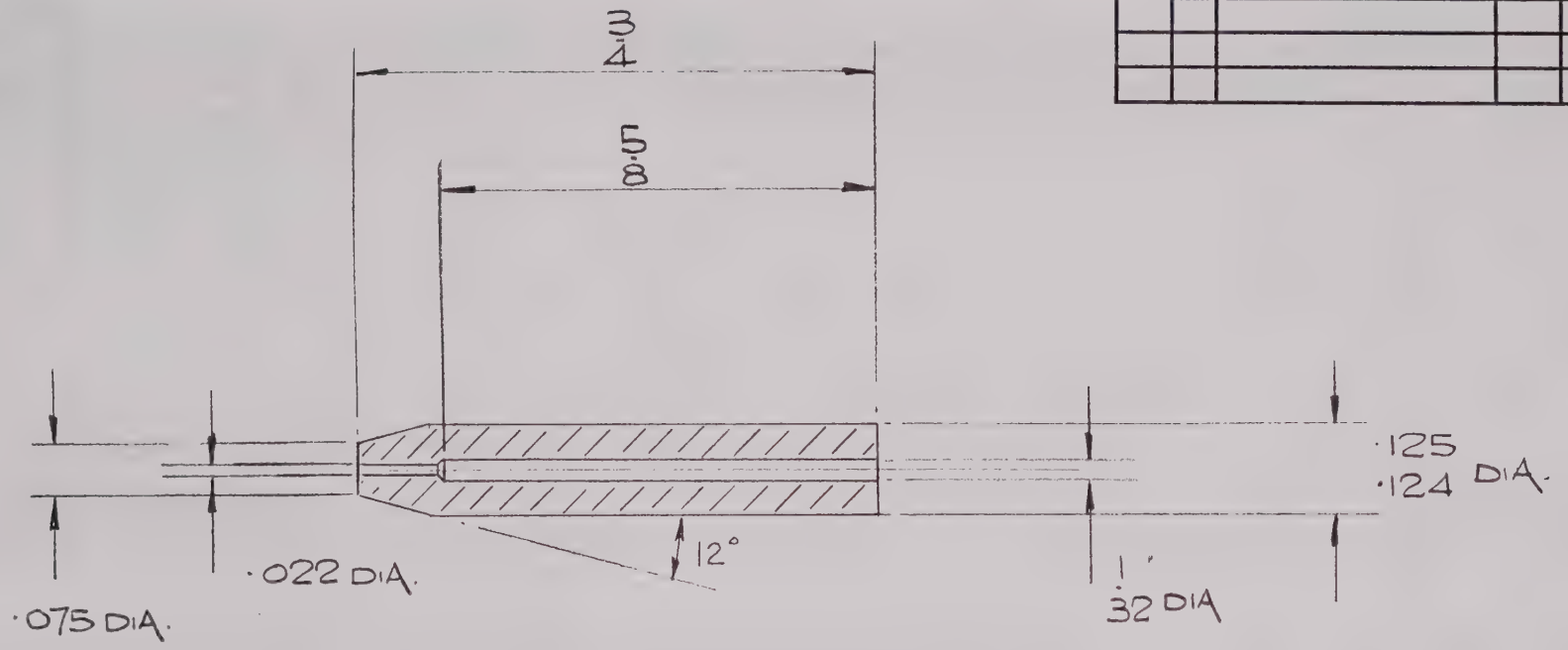
NOTE:
.0135 DIA. TO BE CONCENTRIC TO .125 DIA. WITHIN .001

TOLERANCES (EXCEPT AS NOTED)	REVISIONS			LAURIER INC.		
DECIMAL ± .005	NO.	DATE	BY	TIP - DICE ARM		
FRACTIONAL ± 1/64	1			DRAWN BY L. DUBAY	SCALE 4X	MATERIAL DELRIN
ANGULAR ± 1°	2			CHK'D	DATE 1-20-87	DRAWING NO. 800 0020 B
	3			TRACED	APP'D	
	4					
	5					

REDRAWN 1-20-87

NATIONAL NO. 1BBE-8½X11

DATE	SYM	REVISION RECORD	AUTH.	DR.	CK.



NOTE: .022 DIA. TO BE CONCENTRIC TO .125 DIA. WITHIN .001

THIS PART IS BEING USED WHERE IT CAN BE OPENLY VIEWED ON OUR INSTRUMENT. THEREFORE IT MUST MEET THE FOLLOWING REQUIREMENTS:

1. PART MUST BE MADE FROM DESIGNATED MATERIAL
2. PART MUST BE FREE FROM BURRS AND SHARP EDGES.
3. PART MUST BE SMOOTH AND CLEAN, NO COSMETIC DEFECTS WILL BE ACCEPTABLE.
4. PART MUST BE INDIVIDUALLY PACKAGED IN POLYETHELENE BAG.

TOLERANCES (EXCEPT AS NOTED)	LAURIER INC.		
DECIMAL ± .005	MATL DELRIN	SCALE 4:1	DRAWN BY APPROVED BY JH.
FRACTIONAL ± 1/64	TITLE TIP DIE ARM		
ANGULAR ± 1/2	DATE APR 72	DRAWING NUMBER 800-0072 A	

K+E ALBANENE ® 10 5466 ENGINEERS' STANDARD PORM

MADE IN U. S. A. 29389

Laurier Associates, inc

TITLE: VACUUM DETECTION & VIDEO SWITCH BOARD ASSY

MACHINE: HA225

ML-C9009369

ITEM	QTY.	DWG NO.	DESCRIPTION	MANUFACTURER	REMARKS
1.	1	-6009368	VIDEO SWITCH PCB		
2.	1	-2006409	IC 8031AH		U1
3.	1	-2004862	IC 74LS373		U2
4.	1	-7010299	E PROM FOR VAC. DET. BOARD		U3
5.	1	-2009439	IC LM 339N		U4
6.	2	-2005324	TRANSISTOR 2N3904		Q1, Q4
7.	2	-2001621	TRANSISTOR 2N3906		Q2 Q3
8.	1	-2009735	DIODE ZENER IN4372		D7
9.	6	-2002052	DIODE IN 4148		D1 - D6
10.	1	-2005817	RESISTOR 8.2K		R1
11.	1	-2001660	RESISTOR 47K		R2
12.	1	-2005772	RESISTOR 51Ω 1/4W		R3
13.	8	-2004781	RESISTOR 4.7K	R13, R14,	R4-R7, R9, R10
14.	1	-2005811	RESISTOR 1.2K		R8
15.	2	-2009442	POTENTIOMETER 25K		R11, R12
16.	3	-2009443	CAPACITOR 22μf @ 16V		C1, C2, C15
17.	2	-2009444	CAPACITOR 30pf @ 25V		C3, C4
18.	2	-2004783	CAPACITOR 10μf @ 16V		C5, C12
19.	3	-2009445	CAPACITOR .01μf @ 100V		C6, C10, C11
20.	2	-2002018	CAPACITOR .1μf @ 50V		C7, C9
21.	2	-2009446	CAPACITOR 2.2μf @ 16V		C13, C14
22.	1	-2004993	CONNECTOR SOCKET 14 PIN		K1
23.	1	-2009447	RELAY SIGMA 191 TE1C1-5S		K1
24.	1	-2004853	CONNECTOR SOCKET 28 PIN		U3
25.	1	-2004854	CONNECTOR SOCKET 40 PIN		U1
26.	1	-2007678	CRYSTAL 11.0592 MHz		Y1

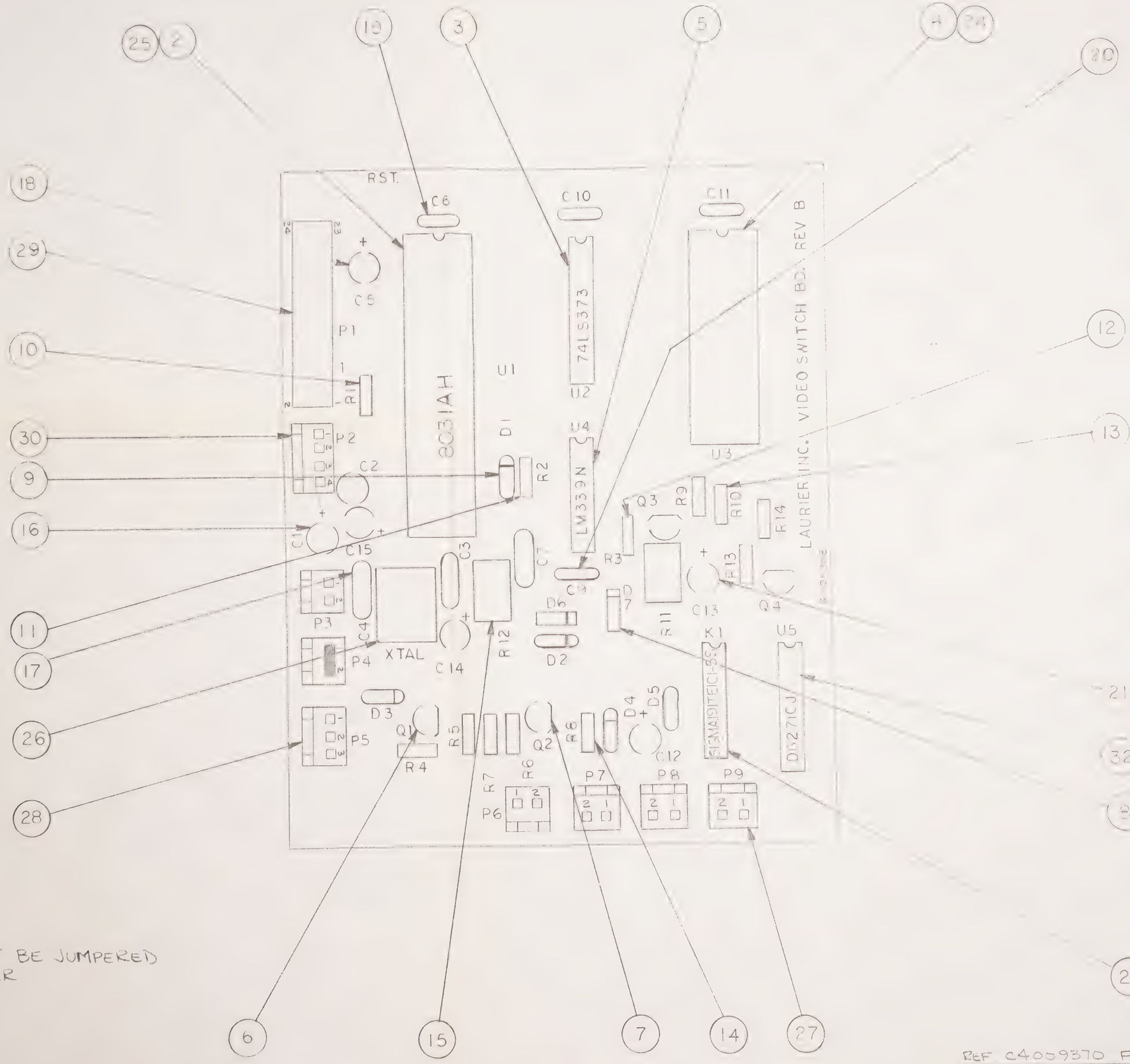
Laurier Associates, inc

TITLE: VACUUM DETECTION & VIDEO SWITCH BOARD ASSY

MACHINE: HA 225

ML-C9009369

ITEM	QTY.	DWG NO.	DESCRIPTION	MANUFACTURER	REMARKS
27.	6	-200944 8	CONNECTOR MALE 2 POS	MOLEX	P3, P4, P6-P9, RST
28.	1	2014050	CONNECTOR MALE 3 POS	MOLEX	P5
29.	1	-200775 9	BERG STRIP 12 POS		P1
30.	1	-2014051	CONNECTOR MALE 4 POS	MOLEX	P2
31.	1½"		WIRE-BUSS 26 AWG		Y1
32.	1	-2004855	CONNECTOR SOCKET 16 PIN		U5
33.					
34.					
35.					
36.					
37.					
38.					
39.					
40.					
41.					
42.					
43.					
44.					
45.	REF	C400937 0	VACUUM DETECT + VIDEO SW. SCHM.		
46.					
47.					
48.					
49.					
50.					
51.					
52.					



NOTE (3)

P4 MUST BE JUMPERED TOGETHER

(3) ADDED NOTE AND JUMPER PER DJF
REDRAW 3-12-87

REF C4009370 FOR SCHEMATIC

TOLERANCES EXCEPT AS NOTED	REVISIONS NO.	DATE	BY
DECIMAL ±	1	2-19-87	786
	2	2-24-87	776
FRACTIONAL ±	3	6-10-91	CG
ANGULAR ±	4		
	5		

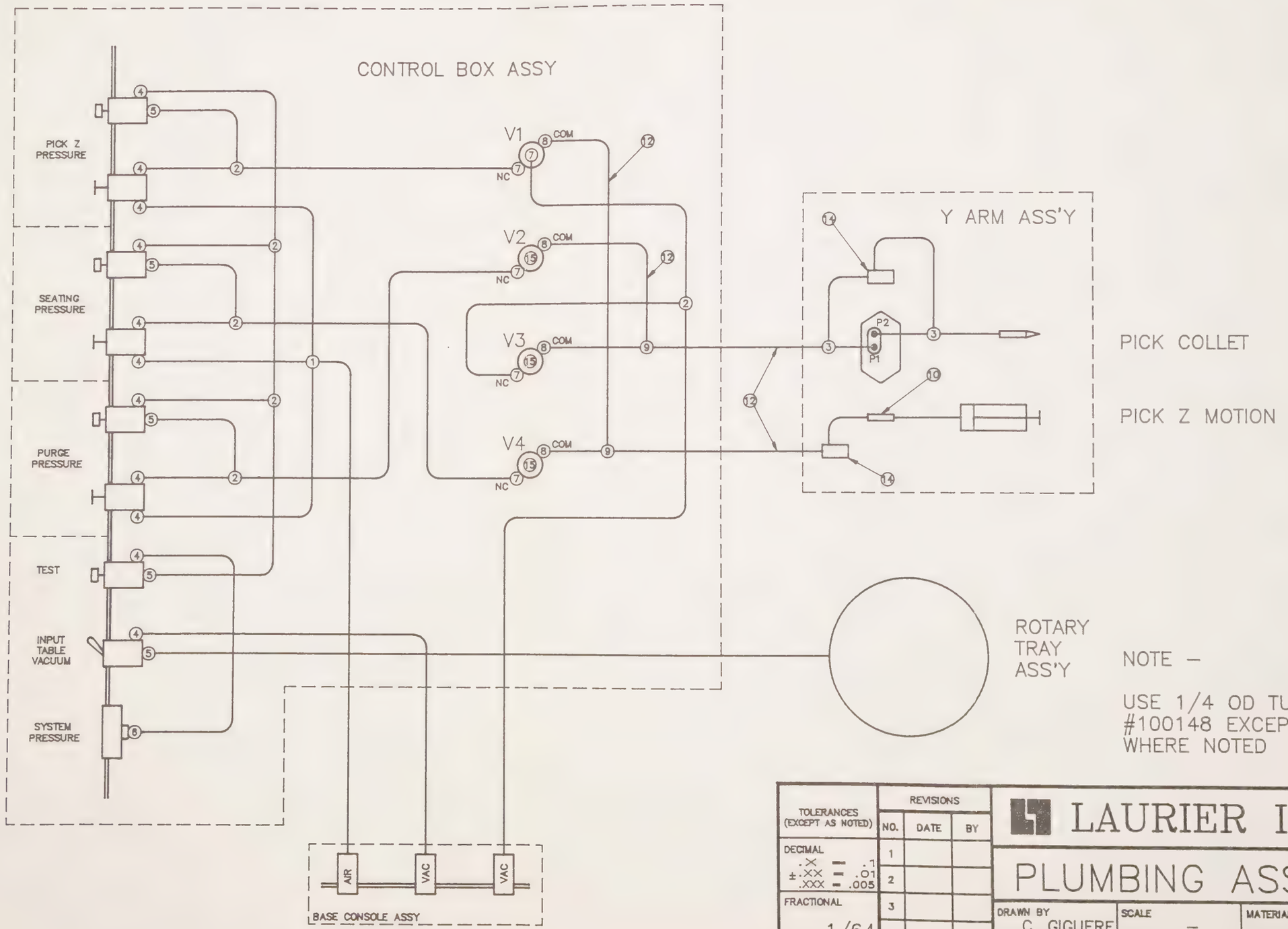
LAURIER INC.

VACUUM DETECTION AND VIDEO SWITCH BOARD ASSY.

DRAWN BY	SCALE	MATERIAL
L. DUBAY	2X	
CHK'D	DATE	DRAWING NO. / REV.
TRACED	APP'D	9009369 / B

LAURIER INC.
BILL OF MATERIAL
ASSEMBLY NUMBER: 9015868

PARENT DESC	ITEM NO	QTY REQ	COMPONENT PART NO	COMPONENT DESC	DESC 2
PLUMBING ASSY	1	1	1002442	FITTING CROSS 1/8 ID TUBE BARB	X3/MEMCO
	2	7	1001343	FITTING T 1/8 ID.TUBE	T3/MEMCO
	3	2	1002431	FITTING T 1/16 ID TUBE	T-1
	4	11	1012922	FITTING L 10-32M-1/8 ID ADJ	MLSB-1332 BESWICK
	5	5	1000178	FITTING 10-32M-.170 ID TUBE	MH-1008-1
	6	1	1000182	FITTING 1/8/ NPTF-1/4 OD TUBE	26-4-2
	7	5	1000183	FITTING L 1/8 NPTM-1/4 OD TUBE	229-4-2
	8	4	1013049	FITTING L 1/8 NPTM-5/32 TUBE	229-5/32-2 PARKER
	9	2	1005394	TEE PLASTIC-1/16 ID HOSE	F-3145-65 A.L.
	10	3	1004111	FITTING COUPLING .170-.078 ID	RC2-4
	11	50	1000148	TUBING .25 OD X .125 URE CLR	3814-6 POLY
	12	20	1000019	TUBING .156 OD .067 IDURE CLR	2M1M-CLEAR
	14	2	1009259	VAR. RESTRICTOR 1/16 ID HOSE	F-2822-20 / AIR LOGIC
	15	3	1006578	FITING PLUG 1/8 NPTM SQ HD	IMPERIAL 109B02



NOTE –

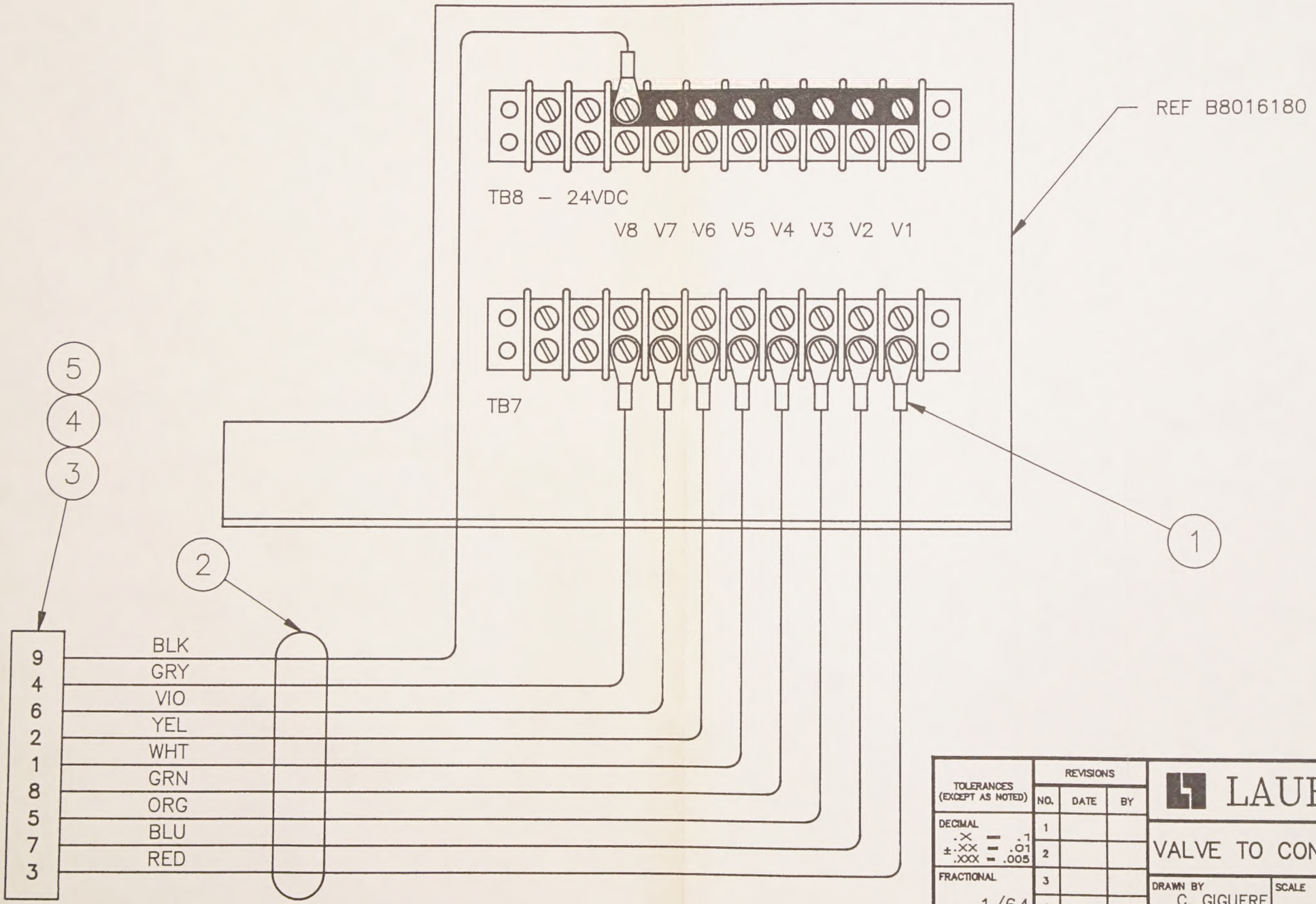
USE 1/4 OD TUBING #100148 EXCEPT WHERE NOTED

TOLERANCES (EXCEPT AS NOTED)	REVISIONS		
DECIMAL .X = .1, ±.XX = .01, .XXX = .005	NO.	DATE	BY
FRACTIONAL ± 1/64	1		
ANGULAR ± 1°	2		
	3		
	4		
	5		
	6		

LAURIER INC.

PLUMBING ASS'Y

DRAWN BY	SCALE	MATERIAL
C. GIGUERE	–	–
CHK'D	DATE 6/7/89	DRAWING NUMBER 9015868
TRACED	APP'D	



TOLERANCES (EXCEPT AS NOTED)	REVISIONS		
	NO.	DATE	BY
DECIMAL .X = .1 ±.XX = .01 .XXX = .005	1		
	2		
FRACTIONAL ± 1/64	3		
	4		
ANGULAR ± 1°	5		
	6		

LAURIER INC.

VALVE TO CONTROLLER CABLE

DRAWN BY	SCALE	MATERIAL
C. GIGUERE	FULL	–
CHK'D	DATE 6/18/92	DRAWING NUMBER 9018884
TRACED	APP'D	

MP MASTER
MA32905